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the 1990s, the number of people in the world who are under 15 years of age is expected to increase by 1.5 billion (United Nations 1994).

There is a growing awareness of the need to address the needs of children in the 1990s. The United Nations Children's Fund (UNICEF) has been instrumental in this regard, and has produced a series of reports on the state of the world's children (UNICEF 1990, 1991, 1992, 1993, 1994). These reports have highlighted the need for a new approach to children's rights, one that is based on the principle of the best interests of the child. This approach is reflected in the United Nations Convention on the Rights of the Child (UNCRC), which was adopted in 1989 and has been ratified by over 100 countries.

The UNCRC is a landmark document in the history of children's rights. It sets out a comprehensive framework of rights for children, and provides a basis for the development of national legislation and policies. The Convention is based on the principle of the best interests of the child, and is designed to ensure that children are treated as individuals, with their own needs and interests taken into account.

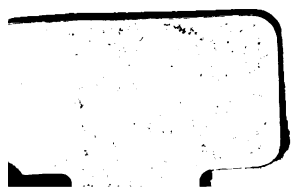
The UNCRC is a comprehensive document, covering a wide range of issues. It includes provisions on the right to life, the right to a name and nationality, the right to a family, the right to education, the right to health, and the right to protection from abuse and exploitation. The Convention also sets out the responsibilities of parents, the state, and the international community in ensuring that children's rights are protected.

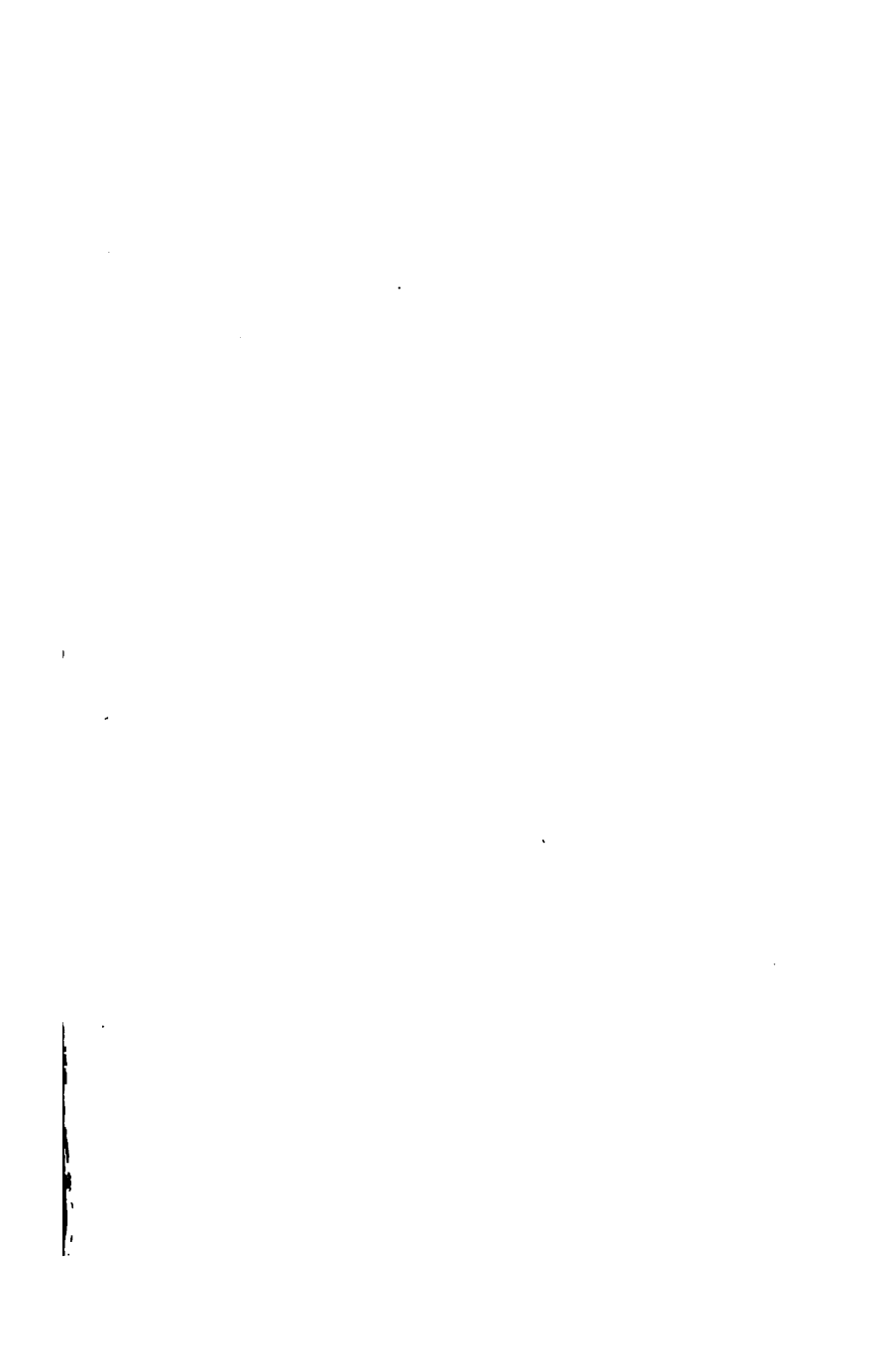
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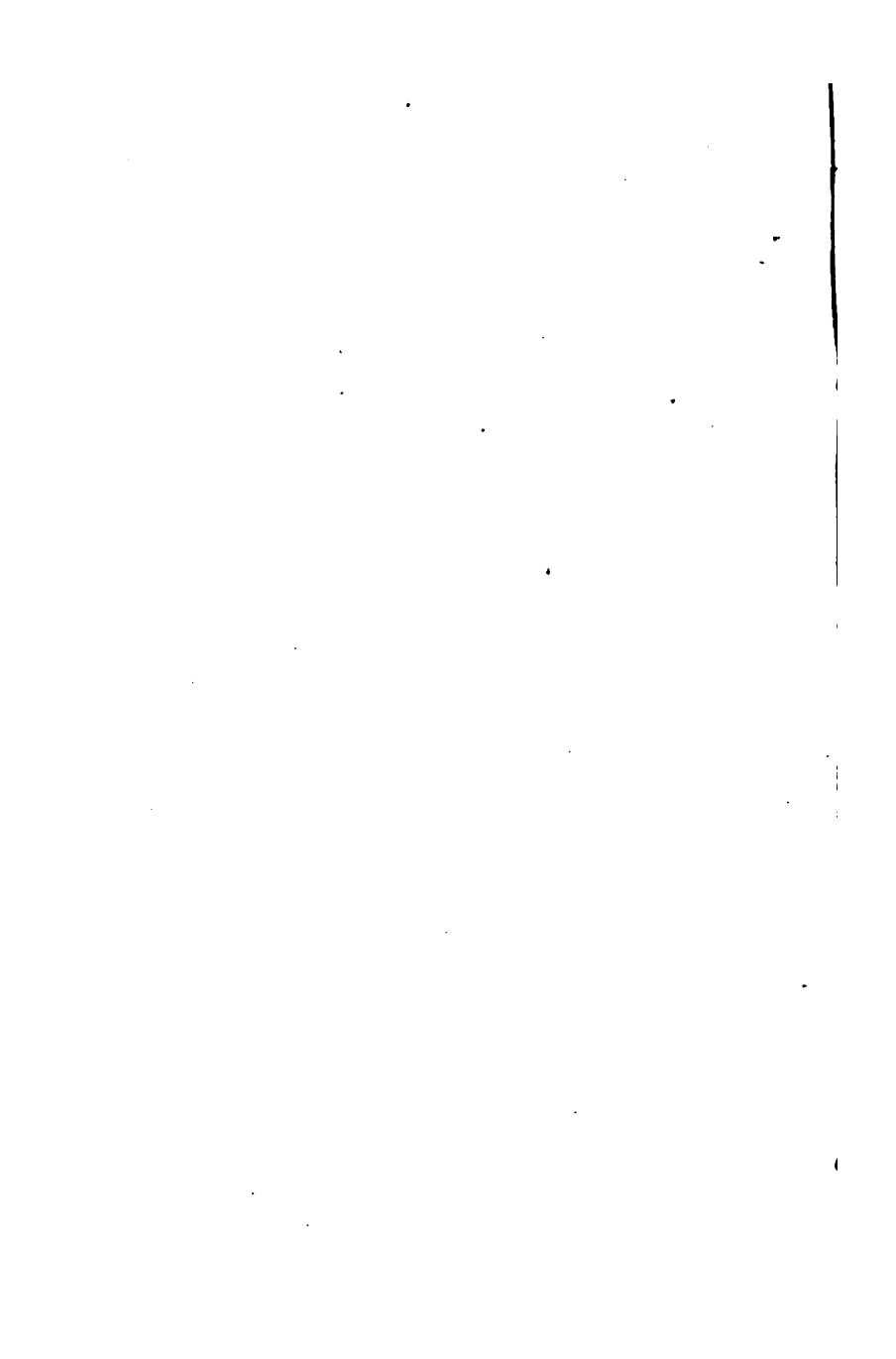
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**THE STUDENT'S GUIDE**  
**TO THE**  
**PRACTICE OF MIDWIFERY**



THE  
STUDENT'S GUIDE  
TO THE  
PRACTICE OF MIDWIFERY

BY  
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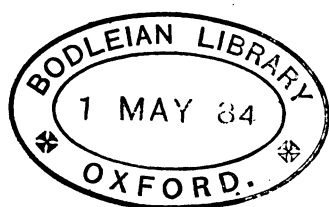
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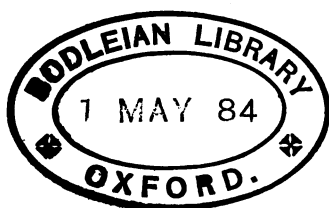
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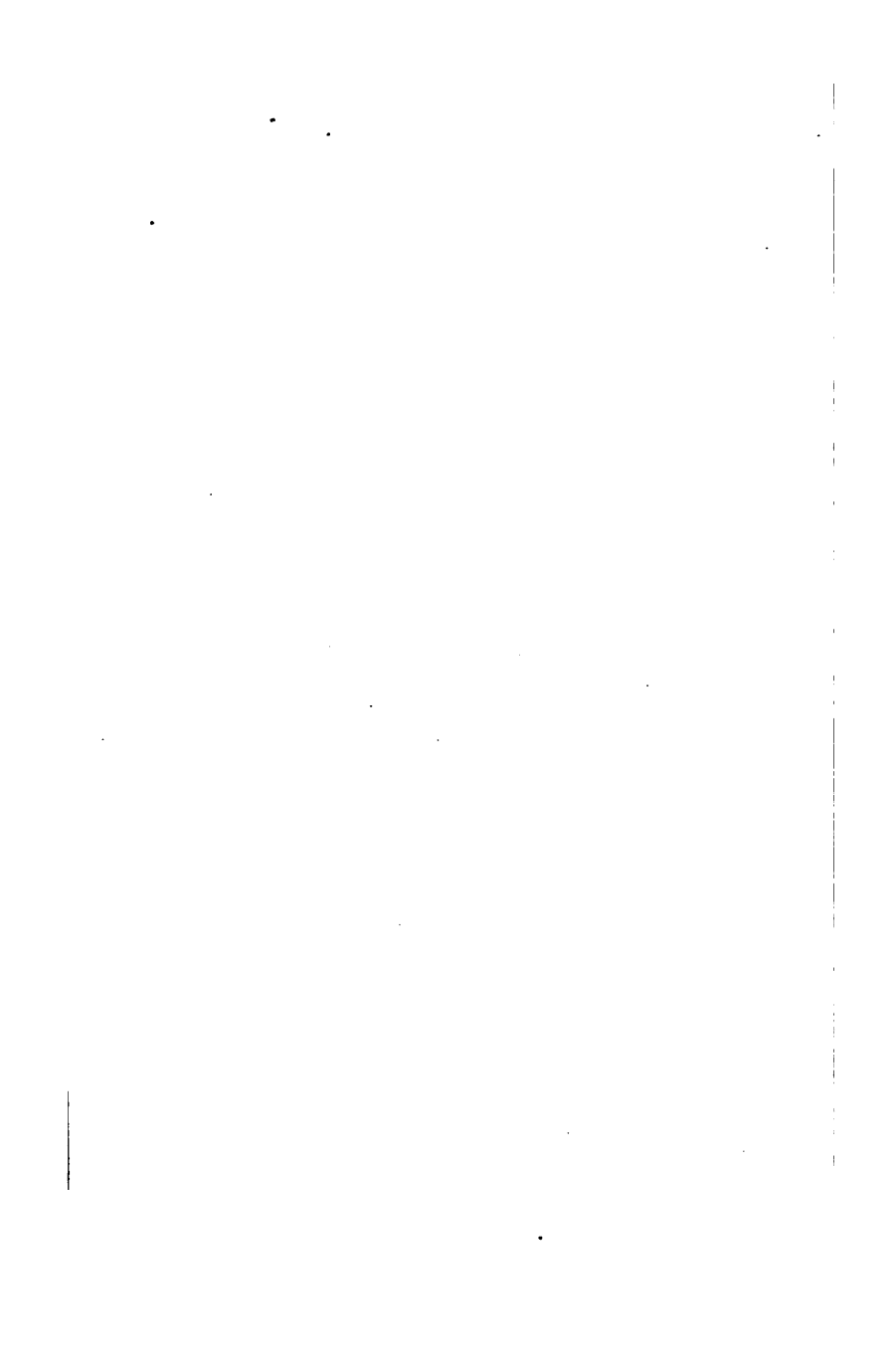
TO  
THE RESIDENT MEDICAL OFFICERS AND STUDENTS  
PAST AND PRESENT  
OF ST. MARY'S HOSPITAL, MANCHESTER,  
I CORDIALLY DEDICATE  
THIS HANDBOOK.



## PREFACE TO THE THIRD EDITION.

THIS third Edition of my handbook I have revised thoroughly, and have in great part rewritten several chapters. I have endeavoured to make it a concise and a practical exposition of the science of Midwifery of to-day. My friend Dr. George Bird I have to thank for his willing help in passing this edition through the press.

11 ST. JOHN STREET,  
MANCHESTER, *January 1884.*



## PREFACE TO THE FIRST EDITION.

THIS Manual is written mainly for the instruction of Students, though I hope it may sometimes be found of service to Practitioners whose scant leisure may make it difficult for them to consult larger works.

My endeavour has been to present as complete a view of obstetrics as the compass of a Manual would permit.

I have been compelled to touch somewhat briefly, yet not I trust inadequately, on points of minor interest, in order to dwell more fully on subjects of serious practical importance. The anatomical portion I have also treated briefly, as I presume that the Student is already practically acquainted with the details of the very foundation of the subject.

The Physiology of Generation, the Mechanism of Labour, and the description of the operations

of Midwifery, I have dealt with according to the relative importance of the several subjects.

I have also endeavoured to treat of the diseases consequent on Parturition—for example, Puerperal Fever—in such a manner as to instruct the Student without confusing his mind with conflicting opinions and speculative theories.

In conclusion, I wish to tender my thanks to my friends Dr. George Bird and Dr. Dixon Mann for much kind and efficient aid they have rendered in the preparation of this work.

23 ST. JOHN STREET,  
MANCHESTER, *December* 1875.

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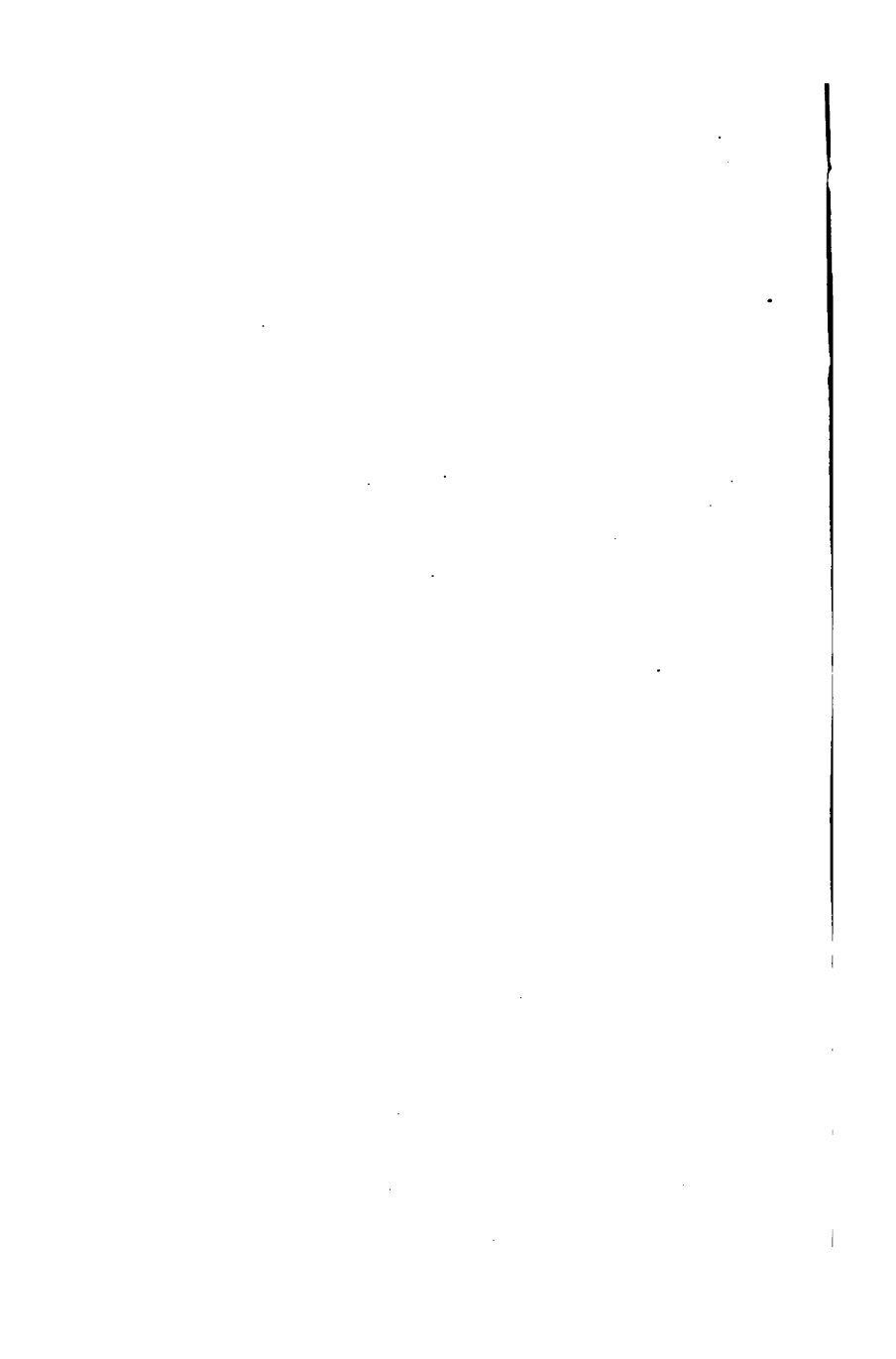
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## CHAPTER I.

### PELVIS.

THE adult pelvis is composed of four bones—namely, the sacrum, coccyx, and two innominate bones. The SACRUM, triangular in shape, with its base upwards, is attached above to the last lumbar vertebra, below to the coccyx, and on each side to the innominate bones.

Its anterior surface is concave, and, obstetrically speaking, is designated the hollow of the sacrum. In a well-formed pelvis, the depth of this concavity measures three-quarters of an inch. The union of the sacrum with the last vertebra forms a considerable angle, called the promontory of the sacrum.

On each side of the median line are the anterior sacral foramina, through which pass the anterior sacral nerves: the pressure exerted on these nerves by the child's head is the cause of the severe cramp from which women so frequently suffer during labour. The external surface is rough and convex, and presents numerous tubercles for the attachment of tendons, muscles, and ligaments. On each side of the sacrum, at its upper part, is a rough ear-shaped surface, which serves for attachment to a corresponding surface on the innominate bone. Below the sacrum, and attached to its inferior extremity, is the coccyx, a small triangular bone, formed of four distinct pieces; its base is uppermost, and its apex, being loose and buried in the surrounding soft parts, has a downward direction. The hinge-like attachment of this bone

to the sacrum allows some degree of motion when pressed upon by the child's head, thus increasing the antero-posterior diameter of the pelvic outlet from half an inch to an inch. In some instances this bone is fixed by ankylosis, which may occasion considerable delay to the passage of the child, and in the efforts of the uterus to overcome this obstruction the bone is sometimes fractured, an accident ordinarily followed with but little inconvenience.



Fig. 1.—FEMALE PELVIS.

**OSSA INNOMINATA** are two irregularly-shaped bones formed by the ilium above, the pubes below and in front, and the ischium below and behind. In the foetus, the ilium, pubes, and ischium are distinct bones.

The **ILIUM** is the upper and expanded portion of the bone which, with its fellow, contributes largely to the formation of the upper and lateral portions of the false pelvis, and mainly supports the abdominal and pelvic viscera. Its internal surface is smooth, and its external rough. The superior rough edge of the ilium, giving attachment to various muscles, is called

the crest, and it terminates anteriorly and posteriorly in an inferior and superior spinous process, likewise serving for the implantation of muscles.

The PUBES is composed of a body, which is joined to its fellow of the opposite side, their junction forming the symphysis pubis, a horizontal ramus which proceeds outward to join the ilium, and a descending



Fig. 2.—DIVISION BETWEEN ISCHIUM, ILIUM, AND PUBIS.

ramus which, passing downwards, joins the ascending ramus of the ischium. The descending ramus of the pubes, conjoined with the ascending ramus of the ischium, form the arch of the pubes. Extending from the pubes to the sacral promontory is an elevated line called the linea ilio-pectinea, which divides the cavity into the true and the false pelvis.

The ISCHIUM occupies the lower part of the pelvis. The external surface is irregular and convex, and forms a considerable part of the acetabulum. The inferior



extremity, called the tuberosity, is rough, for muscular attachment, and is the part upon which the body in a sitting posture rests. Behind the tuberosity is the spine of the ischium, giving attachment to ligaments, and separating the greater and lesser ischiatic notches. Extending obliquely upwards from this tuberosity is a flat process of bone called the ascending ramus, which unites with the descending ramus of the pubes. In the female the internal edge is everted, so as to afford a more spacious outlet for the passage of the child's head under the pubic arch.

The foramen ovale, nearly closed by the obturator ligament, gives exit to vessels and nerves which pass to the upper part of the lower extremities. When the pelvis is small and the cranium is large these nerves are often pressed upon during the head's descent towards the outlet, producing severe pain on the anterior surface of the thigh, which can be much relieved by friction. The joints of the pelvis are usually called symphyses, and do not differ from those in other parts of the body.

*The sacro-iliac symphyses* are irregular and rugged, each surface being covered with a thin and compact layer of cartilage, which presents many points of contact with the surrounding strong ligaments, thus furnishing a very binding connection between the pelvic bones.

*The Pubic symphysis* is formed by a fibro-cartilaginous substance, triangular in shape, included between the articular surfaces of the pubic bones, and rendered firm by numerous ligaments, particularly by the strong and thick sub-pubic ligament.

*The Sacro-vertebral symphysis* is identical anatomically with the articulations of the other vertebræ. The other principal ligaments of interest to the obstetrician are the internal and external sciatic ligaments, which contribute to form the outlet of the pelvis.

For obstetric purposes the pelvis as a whole is divided into true and false pelvis; the true being that portion below the ilio-pectineal line, and the false that portion situated above it. The true pelvis, moreover, is itself divided into brim, cavity, and outlet, and it is the study of the diameters and angles of inclination of these divisions which enables us to understand, and, when necessary, to assist in effecting the expulsion of the foetus. With the false pelvis we have little to do. If deformed it may, it is true, produce certain abnormalities in foetal presentation, still it has no concern with the mechanism of ordinary labour. The true pelvis, then, will claim all our attention. As before stated, it is divided into brim, outlet, and cavity; the brim being formed by the pubis, pubic crests and spines, ilio-pectineal line, and promontory of the sacrum; the outlet by the rami of the ischia and pubes, tuberosities of the ischia, great sacro-sciatic

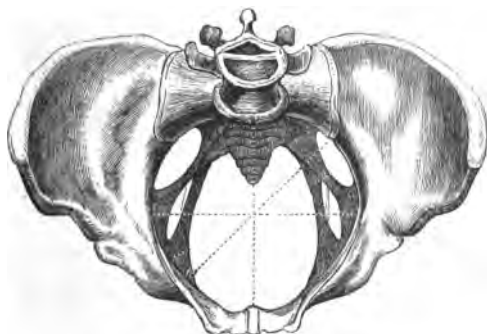


Fig. 3.—BRIM OF PELVIS.

The dotted lines indicate the antero-posterior, oblique, and transverse diameters.

ligaments, and coccyx; and the cavity comprising that portion lying between the brim and the outlet.

*The Brim* (fig. 3) presents an irregular ovoid outline,

with its long diameter across the pelvis. Its dimensions (like those of the cavity and outlet) are taken in three directions—(1) the transverse, (2) the oblique, (3) and the conjugate or antero-posterior. The transverse diameter of the brim measured across its widest part averages 5 inches; the oblique, from the sacro-iliac synchondrosis of one side to the ilio-pectineal eminence of the opposite side, averages 5 inches; and the conjugate, from the promontory of the sacrum to the upper and inner margin of the symphysis pubis, averages  $4\frac{1}{2}$  inches.

There are two oblique diameters, right and left, so named from the respective sacro-iliac synchondroses whence the measurement is taken.

The average diameters in the *cavity* are, the trans-

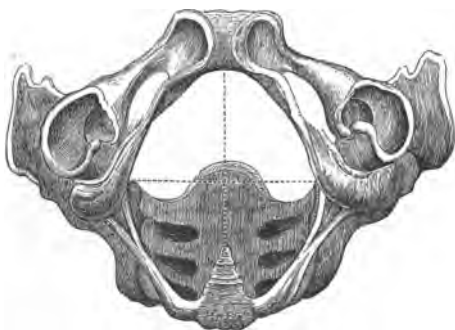


Fig. 4.—OUTLET OF PELVIS.

The dotted lines indicate the antero-posterior and transverse diameters.

verse, measured between the ischia,  $4\frac{3}{4}$  inches; oblique, from the middle of the great sacro-sciatic foramen to the obturator ligament, 5 inches; and conjugate, from middle of sacrum to the pubic symphysis,  $4\frac{1}{2}$  inches. The cavity is deep behind and shallow in front; a line taken directly from the promontory of the sacrum

to the tip of the coccyx measures  $4\frac{1}{2}$  inches, or if it follows the curve of the sacrum  $5\frac{1}{2}$  inches; whilst from the crest of the pubes to the pubic arch is only about  $1\frac{3}{4}$  inch. The shallower the cavity of the pelvis (other conditions being equal) the shorter the labour.

*The Outlet* (fig. 4) measures transversely, between the ischial tuberosities, 4 inches; obliquely, from sacro-sciatic ligament to ascending ramus of ischium, 5 inches; and antero-posteriorly, from tip of coccyx to inferior and inner margin of symphysis pubis, 5 inches. These measurements, taken from the dry bone, are modified by the soft parts, which encroach more on the transverse diameter of the brim than on that of either of the other diameters, leaving the oblique diameter the longest; so that at the brim and in the cavity, the oblique, and at the outlet the antero-posterior diameters are greatest. This variation in their relative measurements necessitates that rotation of the foetal head to be described in the chapter on the mechanism of labour. For handier reference we give the foregoing measurements in tabular form:—

	Transverse.	Oblique.	Conjugate.
Brim .	5 in.	5 in.	$4\frac{1}{2}$ in.
Cavity .	$4\frac{3}{4}$ „	5 „	$4\frac{1}{2}$ „
Outlet .	4 „	5 „	5 „

When a woman stands erect the pelvis presents a certain obliquity to the horizon, the promontory of the sacrum being a little over three inches higher than the upper margin of the symphysis pubis, so that the internal surface of the symphysis pubis is brought into a position approaching the horizontal, the angle formed measuring about  $40^\circ$ , thus affording to the pelvic viscera a support which counteracts the effect of the large size of the pelvic outlet. In order to

express this obliquity in exact terms, use is made of imaginary lines called *Planes of the Pelvis* (fig. 5).

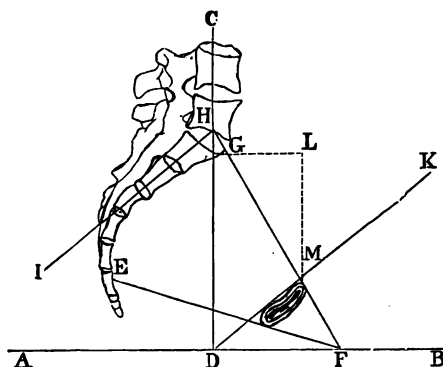


Fig. 5.

- A B.—Horizon.
- A F H.—Angle of pelvic inclination to horizon.
- F H C.—Angle of pelvic inclination to spinal column.
- C H I.—Angle of sacrum to spinal column.
- D K.—Angle of pubes to horizon.
- L M.—Distance between sacral promontory and upper margin of symphysis pubis, about 3 inches.

The plane of the brim, represented by a straight line taken from the promontory of the sacrum to the upper margin of the symphysis pubis, inclines towards the horizon at an angle of about  $60^{\circ}$ . The plane of the outlet, taken from the lower extremity of the sacrum to the pubic arch, forms an angle of about  $15^{\circ}$ . These two planes, if continued anteriorly, will intersect about  $1\frac{1}{2}$  inch in front of and below the symphysis pubis. Tyler Smith gives a third plane, which he calls the mid-plane, taken between the lower portion of the third piece of the sacrum and the symphysis pubis at the level of the upper margin of the obturator foramen, giving an angle of about  $30^{\circ}$  to the horizon.

In this plane it is that rotation of the foetal head takes place.

These planes of the pelvis are used to determine the several axes of the curved pelvic canal. This is accomplished by directing imaginary lines at *right* angles to the several planes (fig. 6), when each of such lines will give the direction of the axis of that portion of the canal to which the plane whence it is derived belongs. Thus the axis of the brim will pass through the umbilicus to the tip of the coccyx at an angle of about  $30^{\circ}$  to the horizon; that of the mid-plane or cavity will be about  $50^{\circ}$ , and that of the lower or plane of outlet about  $80^{\circ}$ .

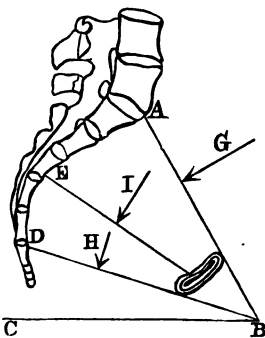


FIG. 6.—PELVIC PLANES AND AXES.

- A B.—Plane of brim.
- E B.—Mid-plane.
- D B.—Plane of outlet.
- G.—Axis of brim.
- I.—Axis of mid-plane.
- H.—Axis of outlet.

It was formerly assumed that the axis of the pelvis as a whole could be demonstrated by striking a curve, called the *curve of Carus*, from the plane of the brim to that of the outlet, the centre of which curve shall be in the centre of the posterior surface of the pubic symphysis, its radius being  $2\frac{1}{2}$  inches. It will, however, be easily understood that the true axis of an irregularly-curved canal cannot be represented by the segment of a circle.

In order, therefore, to ascertain the axis of the entire pelvic canal, an irregular parabolic curve is taken, passing through the centres of an infinity of lines representing the planes of the whole cavity of the pelvis (fig. 7). This curve, beginning with the

uterus above, passes along the vaginal canal, including the perineum below, the last portion of the curve being variable owing to the mobility of the coccyx during labour.

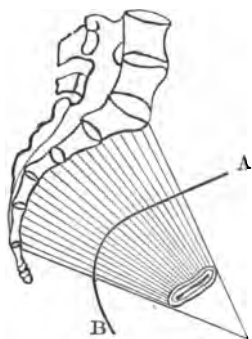


Fig. 7.

A B.—Axis of entire pelvic canal.

During the last stage of labour the perineum is carried so far forward that when the head passes the vulva, a line drawn between the margin of the pubic arch and the anterior edge of the perineum deviates only about  $20^{\circ}$  from the perpendicular. A line erected at right angles to this points almost directly forward, and gives the axis of expulsion.

There are distinctive features existing between the male and female pelvis. The male pelvis expands from before backwards, the brim being triangular. The female bones are smoother and less massive; the brim is much more expanded laterally, being oval in form; the ilia are spread out; the cavity is not so deep as in the male; the space between the pubis and the coccyx is greater in the female; the sacrum is broader and more concave, and inclines to the spine at a greater angle; the cartilage of the symphysis pubis is broader and shorter than in the male; the pelvic cavity being broader in women, the articulation of the thigh bones are farther apart. The distance between the anterior superior spinous processes of the ilia being greater in the female pelvis, the capacity of the crural arch is greater, consequently there is less resistance to the abdominal viscera which accounts for the frequent occurrence of femo-

ral hernia in women. The tubera ischiorum are much wider apart, and the pubic arch describes a more obtuse angle, the average for the female being  $90^{\circ}$ , whilst that of the male is  $75^{\circ}$ .

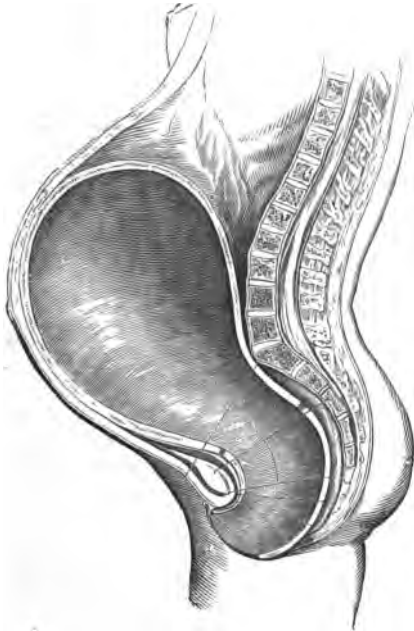


Fig. 8.—THE CAVITY OF THE UTERUS, WITH THE PARTURIENT CANAL FULLY DILATED, SHOWING THE AXES.

PELVIC DEFORMITIES differ greatly both in kind and in degree. In the simplest form the brim only is implicated. Pelves of this class are divided into two groups—symmetrical and asymmetrical. In the first group the contraction is uniform, the pelvis being proportionate in all its diameters, the component



bones being of light and delicate structure. This is by no means a common deformity, and occurs chiefly in women of small but symmetrical build. The pelvis often retains juvenile characteristics, the sacrum being narrower and less curved than in the normal adult condition, and the whole pelvis being placed more obliquely. The following are the measurements of a pelvis of this type from the Museum of St. Mary's Hospital, Manchester :—

	Antero-posterior.	Transverse.	Oblique.
Brim .	3 in.	$4\frac{1}{2}$ in.	$4\frac{1}{4}$ in.
Cavity .	4 „	4 „	
Outlet .	$3\frac{1}{4}$ „	4 „	

In the asymmetrical form, by far the most common deviation, the antero-posterior diameter chiefly suffers diminution, giving rise to the ordinary non-rickety flat pelvis the diminution being caused by excessive projection of the sacrum into the pelvis, together with a slight lessening of all the pelvic bones. The following measurements are from a pelvis in the Museum of St. Mary's Hospital :—

	Antero-posterior.	Transverse.	Oblique.
Brim .	$2\frac{1}{8}$ in.	$4\frac{3}{4}$ in.	$4\frac{3}{4}$ in.
Cavity .	$3\frac{1}{2}$ „	$4\frac{1}{2}$ „	
Outlet .	3 „	$4\frac{7}{8}$ „	

A special form of pelvis is sometimes met with, which, from its approximation in build to that of the male, has been called the masculine pelvis. It is characterised by depth of cavity, narrowing of the outlet from closing in of the tuberosities and spines of the ischia, rotundity of the brim, and smallness of the angle formed by the pubic arch.

Measurements of a masculine pelvis in my own possession :—

	Antero-posterior.	Transverse.	Oblique.
Brim .	$3\frac{3}{4}$ in.	$4\frac{3}{4}$ in.	$4\frac{1}{2}$ in.
Cavity .	$4\frac{1}{2}$ „	$4\frac{5}{8}$ „	
Outlet .	$4\frac{3}{4}$ „	$3\frac{1}{2}$ „	



Fig. 9.—MASCULINE PELVIS.

I shall next consider those deformities which result from *Rickets* and *Malacosteon*.

*Rickets* is peculiar to infantile life, and attacks the osseous system whilst in process of development, causing by some disturbance of nutrition a diminution of the mineral constituents of the bones, which thus become preternaturally pliable, and yield to pressure in such a manner as to lose their original symmetry. When recovery takes place, this alteration in form is rendered permanent through the deposition of the earthy matters previously absent, and the consequent hardening of the bones. In normal infantile bone the organic and inorganic matters are present in about equal proportion, but in rickets the organic matter represents about 80 per cent of

the whole. As the child when labouring under this

disease is unable to walk, the pelvis does not suffer from pressure transmitted by the lower extremities, but is principally affected by the weight of the trunk forcing the sacrum forwards into the pelvis so as to diminish its conjugate diameter.

Dr. C. J. Leopold, in his exhaustive treatise on the "Ricketic Pelvis," states that the characteristic peculiarities of a rickety pelvis are not diminished by a more or less marked skoliosis of the vertebral column; but, on the contrary, are increased, the pelvis, however, being rendered asymmetrical.



Fig. 10.—SKELETON OF A DWARF WITH SKOLIO-RACHITIC PELVIS.

Three factors are concerned in the production of the asymmetry—(1) the pressure and counter-pressure on the pelvis; (2) the strain of the ligaments; and (3) the strain of the muscles. The degree of pelvic asymmetry depends on the amount of skoliosis. The cavity of a skoliotic-rachitic pelvis has a definite shape—the inlet takes the form of a blunt, obliquely compressed heart shape, with more or less narrowing on the side of the lumbar skoliosis,



Fig. 11.—PELVIS DEFORMED BY RICKETS.

and widening on the opposite side. The outlet, on the contrary, is wider on the side of the skoliosis, and narrower on the other side. In the simple rachitic-pelvis the antero-posterior diameter of the outlet is about 52 per cent larger than the conjugate; in the skoliotic form the difference ranges from zero to 34 per cent, the average being only 17 per cent. In the kypho-skoliotic pelvis, on the contrary, the measurements of the outlet are reversed, the antero-posterior diameter being less than the conjugate. The asymmetry results from lateral pressure being associated

with forward pressure, the relative amount of either factor determining the character of the deformity. In the simple rickety pelvis the weight of the trunk produces a downward and forward pressure; but when, as in skoliosis, the vertebræ are deflected side-wise, the line of pressure is no longer wholly vertical; it takes also a lateral direction, and thus the balance between the two sides of the pelvis is disturbed. On the side of the lumbar skoliosis the distance between



Fig. 12.—MALACOSTEON PELVIS.

From a specimen in the Radford Museum, St. Mary's Hospital, Manchester.

the anterior superior iliac spine and the tuber ischii is greater by  $1\frac{1}{2}$  centimetre than on the other side; but between the symphysis pubis and the tuber ischii the distance is less. Dr. Champneys, in a very instructive analysis of a series of skoliotic pelvises, draws attention to the necessity of studying the skeleton as a whole, as in some cases the lumbar skoliosis may be on one side and yet the weight fall on the other, due probably to skoliosis in the upper portion of the spine; also that both sides of the pelvis may show signs of pressure, due probably to alternate skoliosis of different dates in the upper part of the spine,

—facts to be remembered in studying pelvis apart from their vertebral columns.

*Malacosteon* is a disease of adult life; here also we have a diminution of inorganic matter which reduces the bones to a cartilaginous degree of mobility inconsistent with retention of their normal shape. In healthy adult bone the proportion the organic matter bears to the inorganic is as 33 to 66; in malacosteon the proportion is reversed, being as 76 to 23.

Malacosteon is a progressive disease, usually of considerable duration. In the early stage the patient is able to go about, but soon the pressure of the thigh bones on the acetabula causes the pelvis to yield in such a manner as to diminish the transverse diameter, and to give to the outline of the brim a beaked appearance (fig. 12).

It will be observed that the contractions produced by *rickets* and *malacosteon* respectively are exactly opposed in direction, the rachitic pelvis being reduced antero-posteriorly, and the osteomalacic transversely. These are the characteristic deformities assumed by the pelvis in each disease, although, under exceptional circumstances, a more or less approximation in kind may take place.



Amongst the rarer forms of pelvic contraction is the *Spondylolisthetic* (fig. 13), in which the lowest lumbar vertebra moves forwards beyond the

Fig. 13.—SPONDYLOLISTHETIC PELVIS.  
(After Killian.)

sacrum, pushing it backwards at its upper part, and at the same time causing its apex to project forwards into the pelvis and so to lessen the conjugate diameter of the outlet. The transverse diameter of the outlet is also diminished from the displaced sacrum separating the iliac bones above, and thus causing approximation of the ischial tuberosities beneath.

The *Kyphotic* pelvis (fig. 14), as its name implies, is caused by curvature of the vertebræ backwards.

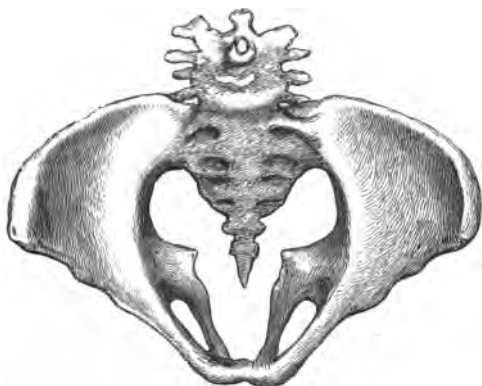


Fig. 14.—KYPHOTIC PELVIS.

From a specimen in my own Collection.

When this takes place at the lumbo-sacral region, the sacral promontory ceases to exist save in name, the upper part of the bone curving directly backwards, the lower part projecting forwards, which changes the normal sacral curve into one of sigmoid outline. The antero-posterior diameter of the brim is greatly increased, as, to a lesser extent, is the oblique; the ischial tuberosities approach each other and the pubic arch is lessened, all the diameters of the outlet being diminished.

When kyphosis is associated with rickets, more or less skoliosis is likewise usually present; Dr. Leopold shows that in such pelves three abnormal influences are to be observed—(1) the signs of rickets; (2) the asymmetry following the skoliosis, and (3) the kyphotic changes which tend to diminish the effect of the rickets. The sacrum is rotated backwards on its transverse axis, and is situated on a higher level than it usually occupies with respect to the ossa innominata; it is also longer and narrower than normal, and presents, as in simple rickets, the usual convexity of the bodies of the vertebræ which compose it. The skoliosis exerts its special influence in producing asymmetry of the pelvis, but not to the extent met with in the skolio-rachitic pelvis. In the kypho-skoliotic rachitic pelvis the inlet is more or less rounded, flattened eventually on one side, corresponding to the kyphotic type; there is relative or absolute increase of the true conjugate, which, however, is always exceeded by the greater transverse measurement. The conjugate is enlarged as regards the skoliotic pelvis and approaches the pure kyphotic type. The antero-posterior measurement of the outlet is diminished, not relatively merely but absolutely. The sacrum, as before said, is narrower, and resembles the kyphotic form. The normal conjugate is partly diminished, and corresponding to the rachitic type partly increased.

Another form of pelvis is sometimes met with called the funnel-shaped pelvis, in which, like the last mentioned, the contraction exists at the outlet, the brim being normal or nearly so.

In the obliquely contracted pelvis of Nægelé (fig. 15), ankylosis of one sacro-iliac synchondrosis with defective development of the corresponding half of the sacrum exists, the outline of the brim being car-



ried over to the opposite side, so that one oblique diameter is increased and the other diminished.



Fig. 15.—OBLIQUELY DISTORTED PELVIS.

From a cast in the Museum of St. Mary's Hospital, Manchester.

The transversely contracted pelvis of Robert is



Fig. 16.—TRANSVERSELY CONTRACTED PELVIS OF ROBERT.

From a specimen in my own Collection.

the rarest of all pelvic deformities. In this pelvis

both sacro-iliac synchondroses are ankylosed, the posterior portions of the iliac bones projecting considerably behind the sacrum; the brim presents an oblong outline, the antero-posterior diameter being much greater than the transverse, which relative proportion is maintained at the outlet; the ischia approach each other so closely that the sides of the pubic arch are nearly parallel. In a fine specimen of this form of pelvis in my possession, the ilia are so thin as to be translucent when held up to the light. The dimensions of this pelvis are given below, and an account of the case from which it was taken will be found in the ninth volume of the *Transactions* of the Obstetrical Society of London:—

	Antero-Posterior.	Transverse.
Brim .	4 inches.	$3\frac{1}{4}$ inches.
Cavity .	$5\frac{1}{8}$ "	$2\frac{3}{4}$ "
Outlet .	$4\frac{3}{8}$ "	$1\frac{3}{8}$ "

An osseous growth may render an otherwise nor-

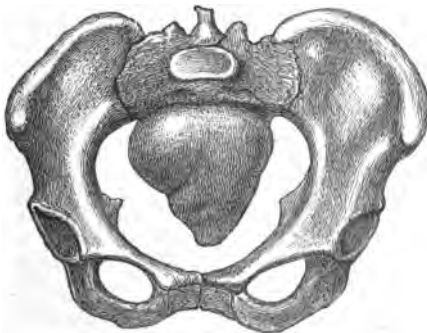


Fig. 17.—EXOSTOSIS OF THE SACRUM.

mal pelvis unfit for the passage of a child. This

abnormality is very rare. The figure (15) is taken from a cast in the Museum of St. Mary's Hospital, Manchester. Cæsarian section was performed by Dr. M'Kibbin. In a pelvis in my possession another phase of exostosis is beautifully shown, the lumbar intervertebral substances being cased in by arched processes of bone extending from one side of each vertebra across the body to the opposite side: on

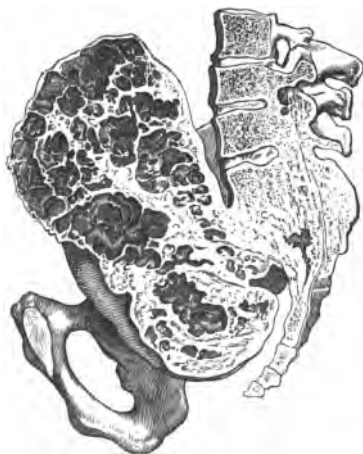


Fig. 18.—SACRAL EXOSTOSIS FILLING THE PELVIS.

each side of the ilio-pectineal line is a sharp projecting spiculum of bone, and these adventitious growths, no doubt, caused the rupture of the cervix uteri from which the woman died; this is commonly called the thorny pelvis.

*Pelvimetry.*—The measurement of contracted pelves in the living subject is effected either with the unaided finger, or with the help of specially devised instruments called pelvimeters. Measurements may be

taken either externally or internally. Baudelocque's pelvimeter is generally used for external measurement. It consists of a large pair of callipers with semi-circular metallic blades, each tipped with a circular button, and with a range adequate to measure the widest diameter of the pelvis. The callipers are furnished with a graduated arc which indicates the space between the extremities of the blades.

Van Huevel of Brussels has lately much improved this pelvimeter. This instrument is used thus:—

1. *The external conjugate* is taken by placing the ends of the blades respectively in the depression just below the spinous process of the last lumbar vertebra and the pubic symphysis. From this measurement about 3 inches are deducted as representing the thickness of the intervening bones and soft parts. This measurement in a well-formed pelvis is  $7\frac{1}{2}$  inches; therefore deducting 3 inches,  $4\frac{1}{2}$  remain to represent the conjugate measurement.

2. The distance from the anterior superior spinous process of the ilium on one side to the same point on the opposite bone measures in a normal pelvis from  $9\frac{1}{2}$  to 10 inches.

3. The distance is now taken from the middle of the crest of the ilium on one side to the corresponding point on the opposite side. This gives from  $10\frac{1}{2}$  to 11 inches.

4. It is often useful to take a fourth measurement, viz. from the anterior inferior spinous process of one side, to the corresponding point on the opposite bone, and this distance generally measures from 8 to  $8\frac{1}{2}$  inches. If the measurements No. 1 and No. 2 are less than above stated, the brim of the pelvis is less than the normal standard. If the distance between the iliac crests be less than the measurement given

the pelvis is flattened and the antero-posterior or conjugate diameter is reduced.



Fig. 19.—Dr. GREENHALGH'S PELVIMETER.

There are many sources of error in external pelvimetry, hence we seek to correct it by —

*Internal pelvimetry.*—

If the forefinger of the right hand is passed up the vagina until the knuckles come in contact with the buttocks, and the point of the finger is directed towards the promontory of the sacrum, it will be found that, in a well-formed pelvis, the sacral promontory cannot be

reached; if, therefore, the finger *does* touch it, the pelvis so far as its antero-posterior diameter goes, is under the normal standard. Dr. Greenhalgh's instrument is admirably adapted (fig. 19) to assist the finger in determining the exact distance between the sacral promontory and the symphysis pubis in contracted pelvis. It consists of a flat metallic ring which encircles the palm of the hand, the instrument having on its palmar aspect a projection through which a rod slides, one end of which is curved, so as to glide along the forefinger. After adapting the instrument to the hand, the forefinger is passed up the vagina until it reaches the sacral promontory, when the rod is drawn out until the curved part, which moves along the finger touches the symphysis pubis. The hand is now withdrawn,

and the distance between the end of the rod and the tip of the finger equals the antero-posterior diameter of the pelvis.

Another excellent form of pelvimeter, devised by Dr. Lumley Earle (fig. 20), dispenses with the aid of the finger. Two curved blades are centred in such a manner that, with the aid of a spring, the ends which are introduced into the pelvis are kept in contact with each other until, by closing the handles, they separate to any required distance, and register the amount of separation by means of a sliding index made to move along the graduated quadrant on which one of the handles slides. In introducing the instrument, the ends of it are guided respectively on to the promontory of the sacrum and to the symphysis pubis, and the distance is read off on the scale.

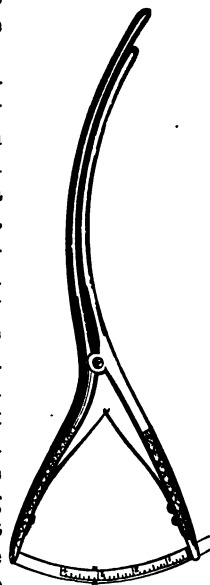


Fig. 20.—DR. LUMLEY  
EARLE'S PELVIMETER.

## CHAPTER II.

## MAMMARY GLANDS.

THE mammary glands, situated on the front of the chest on each side of the sternum, covering a space corresponding to the position of the third and fifth ribs, are covered with adipose and cellular tissue, each breast being hemispherical in form, with a projecting nipple at the centre of its rotundity. The nipple rests on a layer of muscular tissue, which enters into its structure, and enables it, when irritated, to become erect, so as to facilitate the act of suckling.

The skin covering the breasts is like that on the rest of the body, except *the areola*, a circular patch round each nipple, the colour of which varies according to the complexion, being darker in brunettes than in blondes. After the first impregnation the *areola* assumes a deeper tint from deposit of pigmentary matter: the change in colour commences about the second month, and increases during gestation: after lactation is over, the areola becomes lighter in colour, but never resumes the virgin tint. On the surface of the areolæ lie scattered a number of small prominences representing the openings of corresponding sebaceous glands, the secretion from which serves to lubricate the part during lactation. Each mammary gland is plano-convex in shape, and consists of fifteen or twenty lobes, each lobe being subdivided into a number of lobules. The lobules are made up of

aggregations of *acini*, and their epithelial lining is the source of the lacteal secretion. These acini, by their union, form the commencement of the *lactiferous ducts*. Each lobe has its special duct, and all the ducts dilate before they arrive at the nipple, forming what are called the *lacteal sinuses*, after which the ducts diminish in size, and terminate in minute openings on the surface of the nipple. The *lactiferous ducts* are provided with a muscular coat, which, by contracting, forces out the milk, sometimes so energetically as to spirt it out in a jet. Each gland is covered with a layer of fibrous tissue, which dips down between the lobes. The blood supply comes from the external and internal mammary and intercostal arteries, and the nervous from the intercostal branches of the brachial plexus.

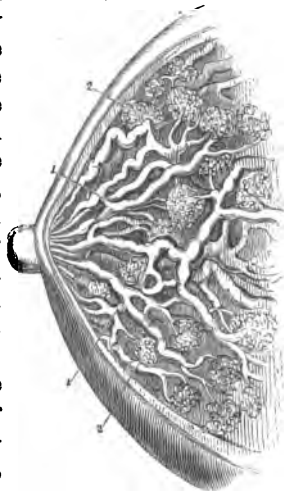


Fig. 21.—MAMMARY GLAND.  
(Tyler Smith.)

- 1.—Lactiferous ducts.
- 2.—Lobuli of the mammary gland.



## CHAPTER III.

## ORGANS OF GENERATION.

THE female organs of generation are divided into external and internal. The external are composed of the Mons Veneris, the labia majora and minora, the clitoris, the vestibule, the perineum, the orifice of the vagina, and the vulvo-vaginal glands. The internal organs comprise the uterus and its ligaments, the Fallopian tubes and the ovaries. The *Mons Veneris* is the triangular, cushiony portion of the integument situated above the symphysis pubis, covered, in the adult, with short curly hair. It varies in size according to the development of the woman, and is composed of adipose and cellular tissues. At the inferior extremity of the *Mons Veneris* is a fold of integument produced by bifurcation of the skin which forms the *labia majora*. The labia majora extend backwards, and form the outer boundary of the genito-urinary opening. They approximate each other before intercourse, but afterwards become longer and more separated. The junction of the labia above is called the superior commissure, their union below the inferior commissure. A fold of mucous membrane stretches across the inferior commissure, called the *fourchette*, and between it and the perineum is a depression called the *fossa navicularis*. The fourchette is nearly always ruptured in the first labour. The labia are composed of cellular and adipose tissues

and a peculiar structure analogous to the *dartos* of the scrotum, and within each labium is a muscle called the constrictor vaginae. The round ligament of each side terminates in the corresponding labium. The external surface is covered with skin, and in the adult with hair; the internal surface with mucous membrane, which is continuous with that of the vaginae. The labia are studded with sebaceous and mucous follicles, the secretion from which occasionally becomes so acrid as to cause a considerable amount of excoriation. These structures are further liable to abscesses, serous, cystic, and blood collections, varices, hernial and malignant tumours. Within the superior commissure, and about half an inch below it, is a sensitive erectile body analogous to the *corpus cavernosum* of the penis, called the *clitoris*, which is attached by two roots to the ischio-pubic rami, the urethra passing between them. A fold of skin, which disappears in each lesser labium, covers the clitoris and serves as a prepuce. Its extremity is tuberculated, and is called the *glans*. Attached to each crus or root is a muscle called the *erector clitoridis*, and a suspensory ligament which connects it with the pubis. The clitoris receives its supply of blood from the internal pudic artery, and its nerves from the internal pudic nerves. It has a dorsal vein, which is the analogue of the *vena dorsalis* of the penis. The clitoris is perhaps the organ principally concerned in the sexual feeling, and, when morbidly excited, is sometimes the cause of retention of urine in hysterical females. The clitoris is subject to syphilitic, fibroid, and malignant enlargements. *Labia minora* or *nymphæ* are two folds of mucous membrane which descend from the prepuce of the clitoris, taking a slightly outward course for about an inch and a half, terminating in a thin prominence, and are lost each in the corresponding labium near its posterior extremity. On their inner surface numer-

ous mucous follicles are distributed, whose secretion serves to lubricate the ostium vaginæ. The nymphæ serve to extend the sensory and secretory surfaces of the ostium vaginæ, and to help to enlarge and expand the vaginal orifice during labour. Deeply seated behind the nymphæ and on each side of the clitoris, are two pyriform bodies of erectile tissue, consisting of reticulated veins covered with fibrous

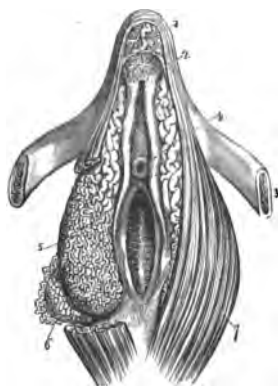


Fig. 22.—1. Vena dorsalis. 2. Glans clitoridis. 3. Crus clitoridis. 4. Meatus urinarius. 5. Bulbus vestibuli. 6. Vulvo-vaginal gland. 7. Sphincter vaginæ. The plexus of veins, constituting the *pars intermedia*, is seen on each side of the nymphæ.

membrane, which are the analogues of the *corpora spongiosa* of the penis; the upper and narrow part being designated the *pars intermedia*, the lower and larger portion the bulb. Below the clitoris and bounded by it above, by the urethra below, and by the nymphæ at the sides, is a triangular smooth space called the *vestibule*, which serves as a guide to the urethra in the introduction of the catheter.

At its lower boundary a little prominent fold of mucous membrane indicates the orifice of the urethra. The urethra, a vascular membranous canal formed by cellular tissue and muscular fibres, is an inch and a half in length, and is capable of great distention. This canal, contracted at its orifice, is destitute of prostate gland or bulb, and is lined with mucous membrane continuous with that of the bladder, and contains numerous lacunæ, which

sometimes impede the introduction of the catheter. Since the operation of *catheterism* may be necessary to draw off the urine during pregnancy, during labour, and after parturition, the student should make himself acquainted with the necessary steps for its accomplishment. The woman being placed on her back or on her left side, a No. 8 male catheter, well warmed and oiled, is taken in the right hand, then the labia are separated with the fore and middle finger of the left hand, and the orifice of the urethra is sought by the forefinger of the right hand; when the meatus is found the instrument is gently introduced, the finger being still retained immediately below the orifice until the bladder is fairly reached. The catheter at first is pushed almost horizontally under the arch of the pubes to the neck of the bladder, when at this point a slight depression of its free end causes it to glide easily into the bladder; the end of the catheter is now depressed towards the vessel placed in readiness to receive the urine. The principal difficulties attending this operation are mechanical obstructions which change the course of the urethra. The development of the gravid uterus, by pulling the bladder with it into the abdomen, or distortion of the pelvic brim, by causing the bladder to be pushed over the symphysis pubis, will in each case produce elongation and curvature of the urethra; in procidentia uteri the position of the bladder is reversed, being drawn below the pubes, so that a downward and backward direction must be given to the catheter. Moreover, after delivery the urethra is often inflamed and swelled, so that it is difficult to find the orifice. In catheterisation in tedious labours where the head of the child is closely packed in the pelvic cavity, the urethra may be so compressed as to require that the head of the child should be pushed upwards and

backwards out of harm's way by the index finger of the left hand while the instrument is slipped into the bladder. Occasionally, during the passage of an impacted head through the pelvis, the bladder may become so compressed at a point behind the pubes as to divide its cavity into two chambers, when care should be taken to empty both before withdrawing the instrument, as rupture or sloughing of the viscus may otherwise ensue. Many cases of vesico-vaginal fistula are doubtless produced by this circumstance. A few lines below the urethral orifice is the vulval aperture, through which pass the menstrual blood and mucous discharges from the uterus and vagina; the opening varies in size according to the presence or absence of a fold of vaginal mucous membrane called the hymen.

The *Hymen* itself varies in shape, the most common variety being the semilunar, then comes the circular and the cribriform. The presence of this membrane is not a proof of virginity, nor its absence a proof of the converse. It may be absent even in a new-born child, and it may be lacerated by very slight violence, as a fall on the perineum, etc.

Intercourse, as a rule, ruptures the hymen, but it may be so flaccid that perfect coitus may take place without lacerating it. On the other hand it may be so tense that it may be necessary to incise it. A firm unruptured hymen is no barrier to pregnancy, for impregnation may take place through a single minute opening, and the resisting structure remain until the advancing head during labour sweeps it away. An imperforate condition of the hymen is of little import until puberty, when the continued accumulation of menstrual fluid behind the membrane causes pelvic and abdominal distention. In this case the proper treatment is to divide the membrane and evacuate the pent-up fluid.

To four or five little bodies which surround the vulvo-vaginal orifice we give the name of *Caruncula myrtiformes*. These are the remains of the torn hymen, and correspond to the number of shreds into which it happens to have been broken. Extending from the posterior commissure to the anus is the *perineum*, a musculo-membranous structure about an inch long and two inches thick, covered externally with integument, and internally with mucous membrane, continuous with that of the vagina. The muscles of the



Fig. 23.—1. Sphincter ani. 2. Tendinous point of perineum. 3. Sphincter vaginae. 4. Transversus perinaei. 5. Erector clitoridis. 6. Aponeurosis. 7. Levator ani. 8. Gluteus maximus.

perineum are for the most part attached by one of their extremities to tendinous structures and fasciæ, one extremity only of each muscle having a bony attachment.

During labour the perineum, stretched by the progressive advancement of the child's head, becomes as attenuated as parchment; but a few hours after labour this structure reassumes its normal condition.

At the posterior part of the labia majora, at their junction with the vagina on each side, are two little bodies, described first by Duverney in the cow, Bartholin in woman, and further carefully examined by Huguier. They are about the size of small almonds, and partake of the nature of salivary glands, having

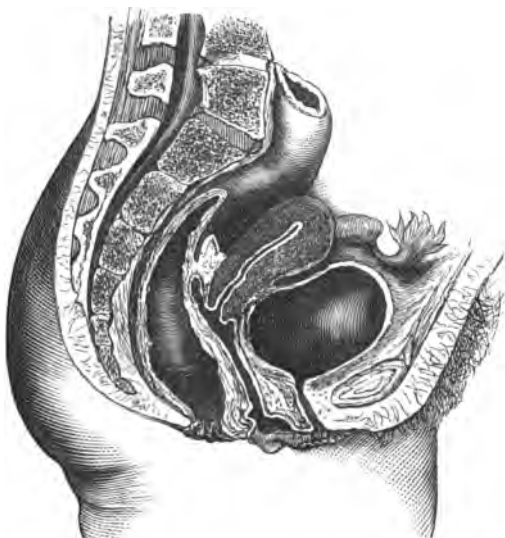


Fig. 24.—SECTION OF FEMALE PELVIC ORGANS.

lobes, lobules, acini, and an excretory duct half an inch long, capable of admitting a small probe, and opening on the internal surface of the nymphæ. The limpid secretion poured out by these glands has a peculiar odour, and flows more freely during intercourse or sexual excitement.

The *vagina* is a tube forming the channel of communication between the uterus and external parts.

It gives exit to the menses, foetus, and lochia, and is the female organ of copulation. It curves upwards from the vulva nearly in the axis of the pelvic outlet until it meets the uterus, with which it forms a considerable angle. The vaginal tube is attached in such a manner to the cervix that a portion of the latter projects into the vagina, thus forming around the uterine neck a circular cul-de-sac, which is deepest at its posterior part. In the adult virgin the vagina is about five or six inches in length, its posterior wall being the longest; but in women who have borne children the canal is shorter. It is narrowest at its mouth, and under ordinary circumstances its walls are in contact, but they readily separate on the introduction of any substance, collapsing again as it is withdrawn. In front the vagina is intimately connected with the bladder and urethra, and behind with the perineum and rectum. About an inch and a half from its upper extremity a fold of the peritoneum dips down between it and the rectum forming the recto-vaginal pouch, and it is here that collections of fluid in the abdominal cavity may be frequently diagnosed. Externally the vagina is composed of cellular tissue, with which it is attached to the adjacent organs. Internal to this is a layer of connective tissue, with a quantity of smooth muscular fibres interspersed, which develop during pregnancy like those of the uterus. This coat is continuous with that of the uterine cervix, and is lined with mucous membrane, which is folded into a number of rugæ, so as to allow the necessary dilatation to take place during labour: these rugæ are most marked on the anterior wall, and are more prominent in virgins than in women who have borne children. During pregnancy the mucous membrane changes from red to dark purple, owing to congestion of its capillaries. The vaginal mucous membrane is covered



with squamous epithelium, and is furnished with follicles which secrete sub-acid mucus, and with papillæ, supposed to be sensory. The vagina is supplied with blood from the internal iliac artery, and its nerves are derived from the hypogastric plexus and the fourth and fifth sacral nerves.

In its unimpregnated condition the *uterus* is a small pear-shaped organ slightly flattened in front. The following measurements of the nulliparous uterus are taken from a table given by Dr. Edis in the *Obstetrical Transactions*, vol. xviii.—Length externally,  $2\frac{5}{8}$  inches; length of cavity,  $2\frac{1}{8}$  inches; breadth of fundus,  $1\frac{1}{2}$  inch; breadth of cervix, about 1 inch; width of os,  $\frac{3}{8}$  of an inch; weight nearly two ounces. The uterus occupies the centre of the pelvis between the rectum and bladder, its lower portion or cervix is attached to the vagina, its body and upper portion or fundus lies free in the pelvic cavity; it is loosely

retained in position by the round and broad ligaments and by its attachment to the vagina. The broad ligaments are formed by folds of peritoneum, enclosing between its layers vessels, nerves, and the musculo-fibrous round ligaments which extend from the upper angle of the uterus to the labia majora. These attachments allow a slight lateral movement, and one much more considerable antero-posteriorly. The axis of the uterus is not easily determined, as its in-



Fig. 25.—SECTIONAL DIAGRAM TO SHOW THE NORMAL POSITION OF THE UTERUS IN THE PELVIS. (After Faite.)

clination depends in great measure upon the relative fulness of the bladder and rectum. It is usually said to correspond with the axis of the brim; this, however, is shown by Dr. A. Farre to be incorrect. It corresponds more nearly with that of the mid-pelvic plane.

The *os uteri externum* is the opening in the cervix seen from the vagina. In the nulliparous uterus the os is linear in form and transverse in direction; the posterior lip is hidden by the anterior, owing to greater length of the anterior wall of the uterus and to the angle of junction of the uterus and vagina. The older anatomists, with their usual sprightly imagination, saw here a resemblance to the mouth of a fish, and accordingly called it *os tincae*. In the multiparous uterus the shape of the os is changed into an irregularly-puckered opening of somewhat circular outline.



Fig. 26.—SECTION OF THE NULLIPAROUS UTERUS.

Transverse section made through the centre of the virgin uterus shows that its cavity is small in proportion to its external dimensions. Commencing at the external os there is a contraction of the canal, which then gradually widens for a short distance, and afterwards contracts until the internal os is reached, where a still narrower constriction is found, which gives rise to the difficulty often experienced in introducing the uterine sound. The os internum leads to the cavity

of the uterus, a triangular cavity, with its apex downwards. The two upper angles appear as rudimentary relics of the cornua found in some of the lower mammalia. At these angles—the thinnest part of the uterine walls—the Fallopian tubes enter. A section of the multiparous uterus displays a cavity of different outlines, being more pyriform than triangular, and more capacious than the nulliparous uterus; the entire organ is also larger and weighs more, averaging about one ounce and a half. The interior of the cervical canal is usually described as corrugated into four folds, which, with the reduplication of the mucous membrane, form what is called the *arbor vitæ*; this appearance is, however, very variable. The folds of mucous membrane present a large surface for glandular secretion, and make provision for the dilatation necessary during labour. The closure, and subsequent dilatation from pent-up secretion, of some of the cervical glands, gives rise to small prominences which are known as *ovula Nabothi*. The structure of the uterus is chiefly muscular, with a peritoneal covering and a mucous lining. The muscular walls are divisible into three layers—the external, thin, and intimately connected with the peritoneal envelope, consists of longitudinal and transverse fibres; the middle thicker layer, in which the large uterine vessels are imbedded, consists of flat fasciculi interwoven in all directions; the inner layer is thin like the outer one. The ultimate composition of the muscular coat includes fusiform fibres having oval nuclei, interspersed with free nuclei, some round and some oval, which appear to be an embryonic condition of the fusiform fibres. There is likewise a quantity of white fibrous, and a lesser quantity of elastic tissue. In the cervix the muscular coat is to a great extent replaced by white fibrous tissue, the remaining mus-

cular element being formed of fusiform fibres, as in the body, though with a few free nuclei interspersed. The mucous membrane is directly attached to the internal muscular coat, without the intervention of the usual submucous tissue, is about one-eighth of an inch thick, and, owing to the abundant supply of capillaries, is of a brighter red than the muscular walls. With the aid of a lens a number of minute apertures, the openings of the utricular glands, are visible, which are described by Reichert as involutions of the mucous membrane. They terminate in closed extremities at the junction of the mucous and muscular coats, and are liberally supplied with capillary vessels of large size, which ramify between the glandular canals and then spread out in a fine meshwork on the surface of the mucous membrane, having the glandular openings in the centre of the meshes. This capillary network is very superficial, being covered only with loosely adherent epithelium, which is shed more or less at each monthly period. According to Henle the epithelium, from the middle of the cervix upwards, is ciliated cylindrical, and below pavement; the secretion of the middle portion is alkaline, that of the lower part acid. The vaginal portion of the os and part of the cervical canal are furnished with papillæ, endowed, it is supposed, with special sensory functions. The uterus is supplied from the internal iliac and spermatic arteries; the veins correspond both in name and direction.

The lymphatics of the body of the uterus join the glands in front of the aorta, those of the cervix communicate with the pelvic and sacral glands. The nerves are supplied in part from the spinal, but more freely from the sympathetic system. According to Dr. Snow Beck the anterior portion of the hypogastric plexus supplies the lower half of the uterus, a branch

from the inferior aortic plexus the body, and a branch from the renal plexus the cervix.

*Abnormalities.*—The uterus may be absent, or its growth may be arrested, so that in adult life it maintains its infantile condition, or it may be abnormally developed into one of the varieties of bifid uterus. The uterus is derived from two bodies existing in early foetal life, called the ducts of Müller, which, by uniting at their lower extremities, form the

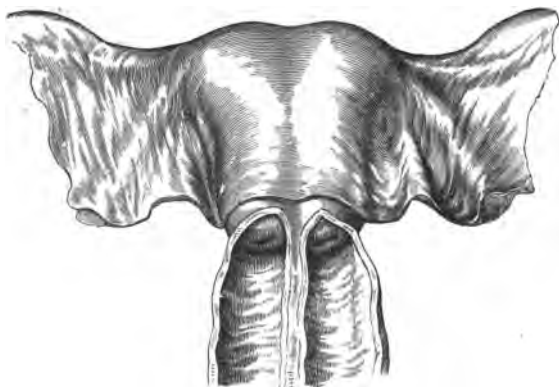


Fig. 27.—BIFID CONDITION OF UTERUS AND VAGINA.

body of the uterus, whilst the upper extremities shorten and become absorbed into the body. On section of the adult virgin organ an indication of the previous existence of these ducts is manifest at the points of entrance of the Fallopian tubes. Owing to some defect in nutrition this dual formation sometimes persists, and is met with in the adult. If the ducts continue to develop independently and separately, a *double* uterus is the result; and in some cases this dual formation extends to the vagina, so that a septum down the middle divides it into two canals.

If the ducts unite at their lower extremities and develop separately above, the uterus is said to be *bicornate*<sup>1</sup> (fig. 28). Sometimes one only of the cornua develops, producing the *uterus unicornis*. In other cases the junction of the ducts more nearly approaches the



Fig. 28.—BICORNED UTERUS.

normal type and gives rise to an organ with one cavity, more or less divided by a medial septum, forming the *uterus bilocularis*, which externally differs but little from the perfectly-formed organ. In cases of entire absence of the uterus, or of an infantile state of development, menstruation is absent, excepting, perhaps, in a vicarious form, although, if the ovaries are normally developed, the menstrual molimen may become periodically manifest. In the other forms of malformation, provided the ovaries are present, menstruation takes place as usual. The effects produced by these abnormalities upon conception and uterogestation will be treated of in the section on superfoetation.

The *Fallopian tubes* may be regarded as the excretory ducts of the ovaries. Each tube is attached by one extremity to the sides of the fundus uteri,

<sup>1</sup> I reported a case of this kind in the *Obstetrical Transactions* for 1871.

into which it opens by a minute aperture, it then passes along the upper border of the middle wing of the broad ligament, gradually increasing in size, until it terminates in the cavity of the peritoneum, in close proximity to the ovaries. The free ends of the tubes are trumpet-shaped, and are provided with a kind of tentacular apparatus, known as the fimbriated extremity of the Fallopian tubes, which, during ovulation, grasps the ovaries, and thus provides a passage for the ovule to the uterus. The ovaries are permanently attached to the Fallopian tubes by means of a prolongation of one of the fimbriae. Like the uterus, the Fallopian tubes have three coats—serous, muscular, and mucous; the presence of muscular fibres has been denied by MM. Robin and Richard, who assert that the middle coat is composed solely of fibrous tissue. Dr. A. Farre, after specially investigating the subject, agrees with Kölliker and others that there is decided evidence of the existence of smooth muscular fibres in young subjects, but that in aged females the muscular element is mostly wanting. The mucous membrane of the tubes, continuous with that of the uterus, is covered with cilia, which vibrate towards the uterus, and with the vermicular action of the muscular coat, assist the ovule in its transit. When, owing to defective propulsive action, the ovule fails to reach the uterus, its arrest gives rise, if impregnation takes place, to one or other form of extra-uterine pregnancy.

The Fallopian tubes receive their supply of blood from the uterine artery, and return it into the plexus of uterine veins; their nervous supply is derived from the hypogastric and aortic plexuses.

The ovaries, the analogues of the testes in the male, are small oval bodies of whitish colour, lying behind the Fallopian tubes in a fold of the posterior

layer of the broad ligament. At one portion, the hilum, the fibrous tissue contained between the layers



Fig. 29.—SECTION OF THE UTERUS, OVARIES, AND APPENDAGES.

of the broad ligament is continuous with the stroma of the ovary; it is at this part that the vessels enter. The outer portion of the ovary (in relation to the uterus) is rounded, and to it is attached one of the fimbriæ of the Fallopian tube; the inner portion is somewhat pointed, and is attached to the uterus by the ligamentum ovarii. The average ovary is  $1\frac{1}{2}$  inch long,  $\frac{3}{4}$ -inch wide,  $\frac{1}{2}$ -inch thick, and weighs about 80 grains. After puberty the surface of the ovary, which has hitherto been smooth and polished, indicates

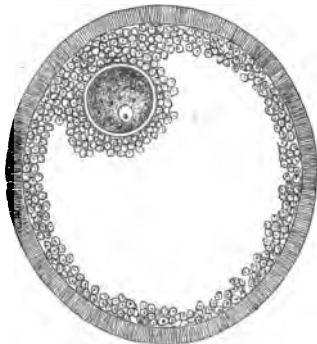


Fig. 30.—GRAAFIAN FOLLICLE AND OVULE WITH PROLIGEROUS DISC.

by small translucent elevations the presence of more or less matured Graafian follicles; corpora lutea, in various stages of atrophy, afford evidence of recently ruptured follicles; whilst minute pits or scars scattered over the surface of the



ovary mark the spots where ova of older date have been discharged, the resultant corpora lutea having in these instances been entirely absorbed. During the menstrual periods the ovaries become turgid, and increase considerably in size ; after the menopause they shrivel up and become wrinkled and uneven on the surface. On section, the ovary is seen to consist of a medullary portion, which is red and vascular, and of a cortical portion, known as the *tunica albuginea*. The medulla is composed of connective tissue, smooth muscular fibres, and blood-vessels ; the vessels large and convoluted at the hilum, according to Rouget, form an erectile organ ; the ovarian nerve supply is derived from the spermatic plexus of the sympathetic. The so-called tunica albuginea is not, as was formerly supposed, a distinct fibrous membrane, but consists merely of several layers of connective tissue, the innermost being continuous with the medullary portion of the ovary, the outermost assuming a denser character than the deeper-seated layers, but not forming a distinct fibrous membrane ; in the innermost layer of the cortex are embedded the Graafian follicles. Formerly the ovaries were said to be covered by peritoneum, but recent investigations show that this membrane ceases at the hilum, where the proper epithelial covering of the ovary begins ; the epithelium of the ovary is of the cylindrical variety, whereas that of the peritoneum is tessellated. Within the layers of the broad ligament, between the ovaries and the Fallopian tubes, lie a number of tortuous tubes which constitute the *Parovarium*. These tubes converge at their ovarian insertion and radiate upwards towards the Fallopian tubes, forming a fan-like arrangement ; they are the remains of the Wolffian bodies of early foetal life, and consist of a fibrous coat lined with cylindrical cells, and are filled

with a small quantity of clear fluid ; they do not open into the ovary, and their use is unknown. According to Kobelt they correspond to the epididymis of the male testicle.

The Graafian follicles are small closed vesicles, situated exclusively in the cortical portion of the ovaries. Waldeyer and other histologists describe them as originating in early foetal life in tubular depressions of the epithelial covering of the ovary, within which are contained the primordial ova, the communication with the surface of the ovary being subsequently cut off by constriction of the peripheral portion of the tubules. Foulis, on the other hand, believes that the follicles are formed by the interlacing of processes of vascular connective tissue in such a manner as to surround the ova. The ova themselves are developed from the germ epithelial cells which primarily form the covering of the ovary, and which, in their turn, are derived from the Wolffian bodies. In each of the Graafian follicles we find one large nucleated cell having a large nucleolus—the primordial ovule. The number of follicles contained in the ovaries is very great—according to Foulis not less than 30,000 exist in each ovary at birth, no fresh ones being formed after birth ; of this vast number, however, comparatively few mature, the rest undergoing atrophy at various stages of development. According to Waldeyer, Graafian follicles range in size from the  $\frac{1}{800}$  to  $\frac{1}{2}$  of an inch. The follicular walls consist of an external vascular covering derived from the ovarian stroma ; internal to this is the true ovisac, also fibrous and vascular, but less firm in texture ; lining the ovisac is a layer of minute granular cells, forming the *membrana granulosa*. In the fully-developed Graafian follicle there is an aggregation of particles of the *membrana granulosa*

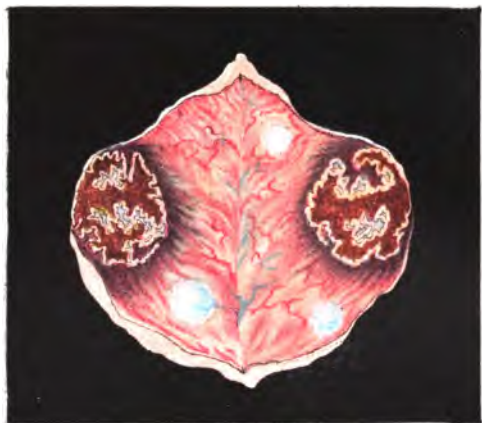
at one spot, called the *proligerous cumulus* or *disc*, in which the ovule lies embedded. The mature follicle is filled with a transparent, alkaline, slightly albuminous fluid, supposed to be secreted from the cells lining the follicular membrane.

The mature human ovule is a globular body, about  $\frac{1}{120}$  of an inch in diameter; it consists of a yelk or vitellus, and its envelope, the vitelline membrane, a thin, structureless, but tough membrane, which, from appearing like a transparent ring amidst the discus proligerus, is also called the *zona pellucida*. In many of the lower animals pores exist in the vitelline membrane, and in some (osseous fishes for example) there has been found a larger aperture to which the name micropyle has been given. These apertures are supposed to afford ingress to the spermatozoa, which, as we shall presently see, penetrate into the interior of the ovule. In the human ovule such openings have not as yet been demonstrated, though their presence may be fairly assumed.

The vitellus consists of a mass of colourless albumenoid matter, containing a quantity of granules and globules which strongly refract light; lodged in the vitellus is a small, delicate, transparent vesicle about  $\frac{1}{800}$  of an inch in diameter, called the vesicle of Purkinje, or the *germinative vesicle*. This is the matured nucleus of the primordial ovule. Within the germinative vesicle is a minute point, the *germinative spot*, measuring, according to Wagner,  $\frac{1}{8000}$  of an inch in diameter. The analogy between the ovule and an ordinary nucleated cell is marked—the germinative vesicle representing the nucleus and the germinative spot the nucleolus. The final stage of development of the unimpregnated ovule is reached immediately before it leaves the Graafian follicle, when the *germinative vesicle* disappears.



PL. I.  
CORPUS LUTEUM (AFTER DALTON)



Menstruation - 10 days.



Pregnancy - 2 to 6 months.

## CHAPTER IV.

## OVULATION AND MENSTRUATION.

THE discharge of an ovule from the Graafian follicle is effected in the following manner:—The maturing follicle increases in size, owing to secretion of fluid into its cavity, and presents itself on the surface of the ovary as a rounded protuberance surrounded by a network of vessels, except at the most superficial part, the *macula folliculi*, where the ovisac is non-vascular; it is here that the follicle eventually gives way and discharges its contents. As the follicle enlarges the macula becomes infiltrated with oil-globules, the result of fatty degeneration. Further secretion of fluid, together with a slight effusion of blood into the follicle, from rupture of some of the capillaries lining its inner surface, increase the pressure, until finally the weakened follicular wall gives way, and the ovule escapes with its surrounding mass of granules, the proligerous disc. The ultimate cause of rupture of the Graafian follicle in the lower animals is attributed in many cases, though not universally, to sexual excitement; in the human female it may occasionally result from this cause. Both His and Rouget are strongly of opinion that the muscular fibres contained in the medullary portion of the ovary, by their contraction, contribute largely to the expulsion of the ovule; and it is not difficult to imagine that such contraction may be induced by the stimulus of sexual

excitement ; at the same time it is probable that in the majority of cases rupture of the ovisac takes place spontaneously ; at any rate we know that coitus is not necessary to produce it.

At the time of rupture of the Graafian follicle the fimbriæ of the Fallopian tube grasp the ovary in such a manner as to apply themselves over the precise spot where the ovule is about to escape ; the ovule is thereby received into the tube and propelled by vermicular and ciliary action towards the uterus. The time occupied by the ovule in traversing the Fallopian tube is not known ; the fertilised ovum, however, has never been found in the uterus earlier than the tenth day after impregnation.

After discharge of the ovule the Graafian follicle undergoes certain changes, which result in the formation of what is known as a *corpus luteum*. Formerly much stress was laid on the difference between the corpus luteum of pregnancy and that of ovulation unaccompanied by impregnation, the former being called the *true*, the latter the *false*, corpus luteum. That a marked difference does exist between the two is obvious, as will presently be shown ; still the difference is one entirely of development, the corpus luteum of pregnancy undergoing processes more prolonged than the corpus luteum of simple ovulation, the processes in each case, however, being substantially the same. We will direct our attention first to the corpus luteum of ovulation, or of menstruation as it is sometimes called. After the escape of an unimpregnated ovule a fibrinous exudation tinged with blood takes place within the ruptured follicle, the walls of which become hypertrophied, convoluted, and vascular ; the hypertrophy is due to increase of the cells lining the ovisac, a process which commenced prior to rupture of the follicle. It is most marked at





PL. II.  
CORPUS LUTEUM (AFTER DALTON)



Pregnancy - at term.



Three days after delivery.

the part of the follicle opposite to the opening through which the ovule escaped ; as the membrane approaches this spot it decreases in thickness. The convolutions of the membrane are due simply to its increase in bulk, the area of the follicular cavity remaining the same. This necessitates a plicated arrangement of the hypertrophied membrane, to pack it, as it were, in a space otherwise too small to contain it.

The hypertrophied membrane continues to increase in thickness from multiplication of the cells and from deposition of fat globules and granules of pigmentary matter, which conjointly impart the yellow colour, whence the name *corpus luteum* is derived. About the end of the third week the corpus luteum has arrived at the climax of its development, after which it diminishes in size and grows paler from absorption of the fat globules and disintegrated cells ; at the end of seven or eight weeks it has disappeared, leaving behind a small depressed, permanent cicatrix. The corpus luteum of pregnancy originates in precisely the same manner as the corpus luteum of menstruation, but instead of commencing to degenerate after the third or fourth week, it continues to develop until the fourth or fifth month, when it measures about one inch by  $\frac{3}{4}$  of an inch, and occupies more than half the bulk of the ovary ; this continued growth causes the two layers of the hypertrophied membrane of the follicle to coalesce and form a yellow mass with a small central cavity. About the sixth month the corpus luteum begins to diminish slowly, both in size and brightness of colour ; after delivery, disintegration goes on with greater rapidity, only slight traces remaining at the end of the second month, the whole generally disappearing about four or five months after delivery.

From the above description it will be seen that there is no real difference between the corpus luteum of menstruation and that of pregnancy, save in degree of development; the so-called true corpus luteum, therefore, can no longer be considered an absolute indication of pregnancy.

*Puberty and Menstruation.*—At a certain age the female undergoes a change, manifested by a periodical discharge of blood from the vagina, by development of the mammæ, growth of hair on the pubes, and a general amplification of the limbs and figure. She is then said to have arrived at puberty, and is competent to take part in the procreation of children. In addition to the physical changes above enumerated, the moral character undergoes a marked change; the girl's manner becomes more subdued, losing the vivacious freedom of childhood, and toning down to the reserved mien of womanhood. The age of puberty varies in accordance with differences of climate, race, constitution, and way of life. In this country the usual age is fifteen years, in the tropics it is about three years earlier, and in frigid countries one or two years later; and as a rule the progeny of the wealthy, and town-reared children menstruate earlier than those of the poor, or the country-bred. The commencement of this epoch is indicated ordinarily by more or less constitutional disturbance, as headache, tympanitic distension of the bowels, pains in the breasts, and general languor. These symptoms, known as the menstrual molimen, usually accompany, in a greater or lesser degree, the periodical recurrence of this function. According to the investigations recently made by Rabuteau the amount of urea contained in the urine diminishes more than twenty per cent during the menstrual nixus; the pulse becomes slower, and the temperature is reduced by

about 1° Fahr. Menstruation recurs at intervals of four weeks, but this regularity is subject to modification from certain constitutional and other causes. In a healthy woman it recurs with uniform periodicity, excepting during pregnancy and lactation, until its cessation at about the age of forty-five years, and thenceforth she becomes incapable of bearing children. During the cessation of the menses, after conception, ovules are neither matured nor discharged from the ovaries.

The average duration of each menstrual flow is five days, and the quantity has been estimated by Meigs at from four to six ounces; but both the duration and amount of the menses are liable to considerable variation without disturbance of the general health. The source of the menstrual discharge is a subject which has long engaged the attention of physiologists, and is still a disputed point. It is admitted on all sides that the menstrual fluid is derived from the mucous membrane lining the interior of the uterus; but the point in dispute is—How is it poured out? It is clear that at each monthly period the whole generative apparatus, including ovaria, Fallopian tubes, and uterus, become congested—the utricular glands and vascular network surrounding them especially participating in this engorgement; the uterine mucous membrane is thickened and tumefied, almost filling up the cavity, and is studded with numerous hæmorrhagic points. Pouchet holds that the mucous membrane exfoliates entirely or in part, and that the capillaries thus exposed furnish the blood; this being precisely what takes place during labour or abortion. In support of this view he instances the fact that in cases of membranous dysmenorrhœa portions of the uterine mucous membrane are discharged. This phenomenon, however, is

exceptional occurrence, and is scarcely adequate to establish a theory. Tyler Smith likewise held that at each menstrual period the mucous membrane is



Fig. 81.—UTERUS OF A WOMAN WHO DIED FROM APOPLEXY DURING THE CATAMENIAL FLOW. The whole of the mucous membrane of the body of the uterus is wanting. (After Tyler Smith.)

cast off, discharged with the blood in a disintegrated condition, and in proof he adduces the post-mortem examination of the uterus of a woman who suddenly died whilst menstruating. In this case the mucous membrane, as far as the cervix, was entirely wanting, and a microscopic examination made by Dr. Handfield Jones and Dr. Smith showed that there was no trace either of epithelium or of utricular glands. This and other cases led Dr. Smith to the conclusion that every month the uterine mucous membrane is detached, becomes excrementitious, and forms part of the men-

strual discharge, a new membrane being developed to supply the place of the old.

The view held by Kölliker is that the superficial capillaries being greatly congested, rupture takes place, and the epithelial lining of body and fundus is, for the most part, thrown off and mixed with the blood and mucus which fill the cavity of the uterus. Detachment of the mucous membrane, partial or complete, he regards as an abnormal phenomenon. Dr. John Williams, in an exhaustive paper published in the *Obstetrical Journal* for 1875, traces, in a series of cases, the cycle of changes which he found to occur in the mucous membrane of the uterus. Dr. Williams states that there is no real period of uterine repose—that even when the menstrual flow is taking place active provision is being made for renewal of the denuded mucous membrane. According to Dr. Williams the mechanism of the menstrual discharge is as follows:—Shortly before the “period” fatty degeneration attacks the surface of the mucous membrane, and spreads down to the muscular wall; then contraction of the uterus drives an increased amount of blood into the mucous membrane, which gives way and allows the blood to escape. The mucous membrane now undergoes rapid degeneration, and is removed cell by cell. Whilst this destructive process is going on active proliferation takes place in the subjacent muscular wall, beginning, like the disintegrative process immediately within the inner os and proceeding to the fundus, so that three days after the cessation of the menses the lower two-thirds, and in a week the whole of the body of the uterus is lined by thin mucous membrane. About the tenth day after the termination of the discharge an abrupt distinction between the mucous membrane and the muscular wall commences near the cervix.

and spreads to the fundus, which it reaches a little before the bleeding recommences. The mucous membrane is now at its highest stage of development attainable in the unimpregnated state, and is in a fit condition to receive the impregnated ovum. Failing impregnation, fatty degeneration sets in, and the whole process is repeated. Dr. Williams sums up by stating that menstruation is neither a congestion nor a species of erection, but a molecular disintegration of the mucous membrane of the body of the uterus, followed by hæmorrhage.

Examined microscopically the normal menstrual discharge is found to consist of blood discs, mucous corpuscles, epithelial cells, and fatty granular matter; if the flow is abnormally rapid, the discharge assumes more the character of ordinary blood. In its chemical character menstrual blood does not materially differ from ordinary blood; it gives out, however, a peculiar odour which, in some women, manifests itself during the *nisus* in the breath and perspiration. It has long been known that menstrual blood does not coagulate, a peculiarity caused by its admixture with the acid mucus of the vagina; for if the discharge is allowed to flow through a speculum direct from the uterus, so as to escape contact with the vaginal mucus, the menstrual fluid, from admixture with the uterine mucus, is then alkaline, and readily coagulates. In cases, too, of menorrhagia, the blood, being poured out rapidly or in excessive quantity, does not become mixed with the vaginal mucus, and so retains its property of coagulation. The cause of menstruation originates in the ovaries, and is generally supposed to be coincident with the maturation of a Graafian follicle; when both ovaries have been extirpated menstruation ceases permanently. In cases where both ovaries are extirpated in childhood, as is the custom in some

eastern countries, not only is the menstrual function entirely abolished, but many other attributes of the sex disappear or undergo modification; the *timbre* of the voice deepens, and there is a tendency to the growth of hair on the face—such changes pointing to the ovaries as the *fons et origo* of some of the characteristic features of the female sex. The condition known as *rut* or *œstrus* in the lower mammalia corresponds to the period of ovulation in the human female; but in animals it is unattended by any flow of blood. Against this theory is instanced the fact that in the lower animals coitus is permitted only, and fecundation is possible only, during the period of rut—at other times the female will not suffer the approach of the male; that in the human female, on the other hand, impregnation takes place usually during the first week *after the cessation* of the menses, and that it may occur at any point of time between the menstrual periods. Coste, in explaining this, states that it is the maturation, not the dehiscence of a Graafian follicle which initiates menstruation, and consequently that the escape of the ovule may not take place until after the menstrual period has ceased. Again, we do not know how long the ovule takes to reach the womb, or how long it will retain its vitality. The difference between rut and ovulation is not so pronounced therefore as would appear at first sight. The further question of periodicity in the sexual appetite is not worth discussing. Man's mental endowments, together with the artificial mode of life attendant upon civilisation, are adequate to account for great modifications in this respect.

A peculiar abnormality is occasionally met with, generally among women of a highly nervous organisation, known as vicarious menstruation, in which a



periodic discharge of blood takes place from some part of the body other than the womb. The mucous linings of the lungs, stomach, or nasal cavities, or anus when it is the seat of piles, and chronic ulcers, are the most usual sites of this phenomenon; more rarely it occurs on some external part of the body where the skin is intact. No explanation can be offered as to the cause of this phenomenon.

## CHAPTER V.

## DEVELOPMENT OF THE OVUM.

HAVING described the process of ovulation, with its coincident function menstruation, and the formation and disintegration of the corpora lutea, we now come to those wondrous series of changes in the impregnated ovule, ending in the production of a human being.

Thesemen—thefecundating medium—is developed in the testes of the male, and consists of a whitish viscid fluid containing a vast number of animated filaments called spermatozoa. In addition to the potential elements derived from the testes, secretions from the vasa deferentia, vesiculæ seminales, and the urethral and prostatic glands enter into the composition of the seminal fluid ; it is chiefly to the prostatic fluid that the whitish appearance of semen is due. Amongst its chemical constituents may be enumerated the phosphates and chlorides of magnesia, and an organic product, spermatine, which is analogous to ordinary mucine. Semen taken direct from the testes and examined under a high magnifying power consists of a clear fluid, containing, in addition to epithelial cells and granular matter, sperm-cells and spermatozoa. The sperm-cells are of two kinds, large parent cells and secondary cells. The parent cells consist of a transparent membrane, forming a spherical envelope which encloses five or six of

the secondary cells in which the spermatic filaments are coiled up. Previously to emission of the semen, the walls of the sperm-cells disintegrate and liberate the spermatozoa, the cells themselves being rarely

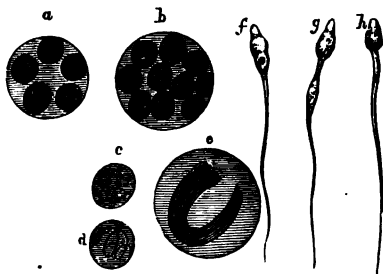


Fig. 32.—a, b, Sperm cells containing nuclei, each nucleus having within it a spermatozoon. c, Nucleus with nucleoli. d, Nucleus with spermatozoon. e, a cell with a bundle of spermatozoa. f, g, h, spermatozoa.

seen in ejaculated semen. The spermatozoon consists of a flattened oval head, from which is prolonged a fine tapering filiform process or tail; the head is about  $\frac{1}{8000}$  of an inch long,  $\frac{1}{8000}$  of an inch wide, by  $\frac{1}{8000}$  of an inch thick; the tail being about  $\frac{1}{800}$  of an inch in length. The characteristic movements of the spermatozoa by which they propel themselves along the genital tract of the female is produced by whip-like undulations of the filamentous portion. This peculiar movement formerly led to the supposition that the spermatozoa were animalcules, the prevailing opinion now being that their movements are due to the same cause as those of ciliated epithelium. It has been proved experimentally by Spalanzani, Prévost, and others, that the spermatozoa are the actual fecundating agents, the containing fluid acting only as a medium or vehicle. Under favourable conditions, as in the uterus and Fallopian tubes,

the spermatozoa retain their activity for many days. In old age the procreative faculty ceases in the male, although many instances to the contrary are recorded, spermatozoa in active movement having been found in the testicles and seminal fluid of men far advanced in life; Wagner, indeed, states that it is only in weakly individuals that the procreative faculty is really lost.

For the development of the ovum it is necessary that it should come in contact with the male seminal secretion. In some of the lower creatures—fishes, for example—impregnation is effected after the female has discharged her eggs; in others, as birds, impregnation takes place before the egg is extruded; in the higher order of mammals, including man, provision is made not only for fecundation of the ovum within the female organs, but also for its development.

In the human subject, after a fruitful intercourse, the male seminal fluid is ejected to the upper part of the vagina or even into the uterus, its spermatozoa, partly by their independent action, partly by the action of the uterine cilia, which vibrate upwards, then come in contact with the ovule at some part of the genital tract, and impregnation is the result. The actual spot where the union of the ovule and the spermatozoa occurs is not known; that it may happen immediately after rupture of the Graafian follicle, or perhaps even before rupture, is proved by the occurrence of ovarian pregnancy. Probably in the great majority of cases contact takes place in the Fallopian tubes. The power of locomotion possessed by the spermatozoa, when assisted by the uterine cilia, is so considerable that ejaculation to the upper part of the vagina is not necessary for impregnation, for cases have occurred where the

mere deposition of spermatic fluid on the vulva has been sufficient to produce fecundation of the ovule. Meissner and others have demonstrated that the

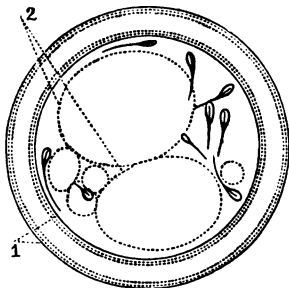


Fig. 33.—OVUM OF A RABBIT CONTAINING SPERMATOZOA.

1. Zona pellucida. 2. The germs, consisting of two large cells, several smaller cells, and spermatozoa.

spermatozoa penetrate into the interior of the ovule and amalgamate with the yelk. The mechanism of this process has been previously discussed.

In the passage of the ovum along the Fallopian tube the cells forming the proligerous disc disappear, their place being taken by a layer of albuminous matter, forming in the case of birds the well-known "white of egg." At about this stage there is at one point a separation of the vitellus from its membrane, and the ovule, according to Robin, refracts light more strongly than before. The next step is the formation of a clear spherical body called the *polar globule*, which is situated between the vitellus and the vitelline membrane; it is at this spot that the segmentation of the vitellus commences. Soon after the appearance of the polar globule, a clear, amorphous, spherical mass appears in the centre of the vitellus called the *vitelline nucleus*, which is really the first

evidence of impregnation, for all the previous changes just described are occasionally observed in unfecundated ovules.

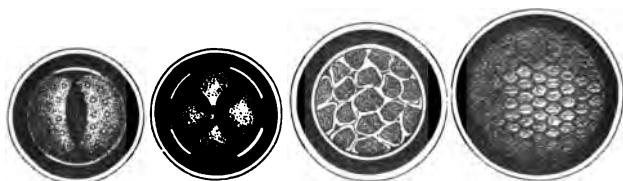


Fig. 34.—SEGMENTATION OF THE VITELLUS. (After Dalton.)

Segmentation of the vitellus now begins near the polar globule; a fissure forms round the vitellus, which, extending in depth, gradually splits it and also the vitelline nucleus into two segments. About the same time another fissure forms at right angles to the first, and divides the two segments into four, which undergo a similar quadruple sub-division, again and again repeated until the whole is converted into a congeries of globular bodies, designated the *mulberry mass*, each ultimate subdivision containing a nucleus formed of a segment of the vitelline nucleus. These globular bodies consist of protoplasm, and are at first devoid of cell wall, which, however, is soon formed, with the addition of a nucleolus within the nucleus. The cells are now pressed together against the inner surface of the vitelline membrane, and, assuming a polygonal shape, unite at their edges to form the blastodermic membrane. The ovum now consists of the vitelline membrane, lined by the blastodermic membrane, which contains the remains of the yelk

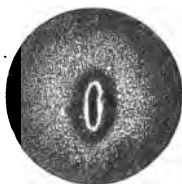


Fig. 35.—AREA GERM-NATIVA, AREA PELLUCIDA, AND PRIMITIVE TRACE.

and a small quantity of fluid. At about this stage of development the ovum reaches the uterus, and now therefore let us direct our attention to the preparations made in that organ for its reception.

The first feature to be noticed is the increased vascularity and great thickening of the uterine

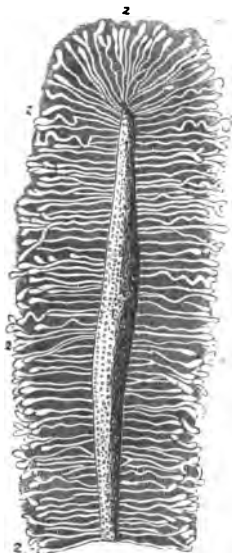


Fig. 36.—SECTION OF THE LINING MEMBRANE OF THE UTERUS AT THE BEGINNING OF PREGNANCY, TWICE THE NATURAL SIZE. 1. openings of glands on the surface of cavity. 2. The utricular glands.



Fig. 37.—A PORTION OF GLANDULAR STRUCTURE SEVERAL TIMES MAGNIFIED. 1, 1, Orifices of glands. 4. Caecal extremities of glands. 5. Tubular portion of glands.

mucous membrane, which presents a tumefied velvety appearance, and has received the name of *decidua vera*, because it is cast off during labour. The whole of the uterine mucous membrane except that of the

cervix takes part in formation of this structure, it extends from fundus to os internum; the cervix meanwhile becomes blocked up by thick viscid mucus secreted by the cervical glands. The ovum on reaching the uterus becomes arrested near the opening of the Fallopian tube, and lodges in one of the numerous depressions in the decidua vera, which by degrees forms a kind of embankment round the ovum, extending over it until it is entirely covered in between the decidua vera and this new formation, called the *decidua reflexa*. The decidua vera, then, is simply the uterine mucous membrane hypertrophied, the decidua reflexa being a new growth derived from it. During the first months of pregnancy the space between the decidua vera and reflexa contains a small quantity of serous fluid—the hydroperione of Breschet—which is absorbed as the two deciduæ come into apposition. This union takes place between the third and fourth month of pregnancy, the two layers



Fig. 38.—IMPREGNATED UTERUS, SHOWING FORMATION OF DECIDUA. (After Dalton.)



Fig. 39.—IMPREGNATED UTERUS, SHOWING OVUM COMPLETELY ENCLOSED BY DECIDUA REFLEXA. (After Dalton.)

then forming one membrane. The portion of decidua to which the ovum is attached is called the *decidua*



*serotina*, the site, as was previously stated, of the placenta. Towards the end of utero-gestation the decidua becomes thinner, and is gradually loosened from the uterine parietes by fatty degeneration of the points of attachment, preparatory to its expulsion when the proper time arrives. About the fourth month a fine homogeneous layer begins to form between the decidua and the muscular coat of the uterus, which is the first step towards the formation of a new mucous membrane. Its growth is very slow, and is not completed until two months after delivery.

To return to the ovum:—At one part of the internal surface of the blastodermic membrane, a small mass of cells may be observed remaining over and above those which entered into the formation of the blastodermic membrane. These cells gradually extend themselves over the internal surface of the



Fig. 40.—FECUNDATED OVUM, SHOWING AMNIOTIC FOLDS. (After Dalton.)



Fig. 41.—FECUNDATED OVUM, SHOWING THE DORSAL AND ABDOMINAL PLATES. (After Dalton.)

blastodermic membrane, and form what is known as the internal blastodermic membrane or *hypoblast*. Between the internal and external blastodermic membranes, a third layer is afterwards formed—the

*mesoblast*, which separates, as will presently be seen, into two distinct strata. The vitelline membrane still envelops the ovum, which thus possesses four tunics. The relations borne by these laminae to the component parts of the fully-developed fœtus are as follows:—From the external blastodermic membrane—the *epiblast*—are formed the epiderm, the cuticular glands, hair, nails, brain, spinal cord, and the organs of special sense. From the outer stratum of the *mesoblast*, the corium, skeletal muscles, and osseous system: from the inner stratum, the muscles of animal life, the digestive tract, the blood, blood-vessels and blood-glands. The *hypoblast* yields the intestinal epithelium and glands. The next step is the formation of the *embryonic spot* or *area germinativa*, which is merely an ovular-shaped condensation of the external blastodermic membrane; occupying the centre of this is the *area pellucida*, a transparent space where the cells of both external and internal membranes

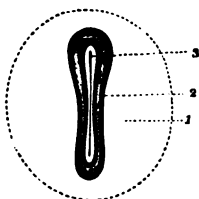


Fig. 42.

1. Area pellucida.
2. Laminae dorsales.
3. Primitive trace.

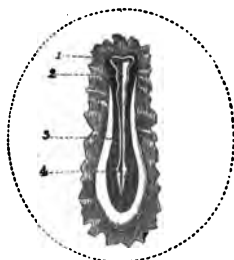


Fig. 43.

1. Commencement of cerebrum. 2 and 3. Cerebellum and spinal marrow. 4. Commencement of vertebral column.

are fewer in number ; within this, again, is a fine line, the *primitive trace*, the first indication of the embryo.

The blastodermic membrane now forms two ridges, one on each side of the primitive trace; these are the *dorsal plates*, which grow towards each other in crescentic form so as to meet eventually in the median line. They there unite and form a tubular canal, which encloses within it the primitive trace, and is the origin of the spinal cord. The centres of the bodies of the future vertebræ are at this period indicated by a columnar arrangement of cells called the *chorda dorsalis* or the *noto-chord*. This structure does not actually enter into the formation of the vertebræ, but traces of it may be found in the bodies of the vertebræ, and in the intervertebral plates at a late period in foetal life. The vertebræ are formed from



Fig. 44.—FECUNDATED OVUM, WITH ALLANTOIS FULLY FORMED.  
(After Dalton.)



Fig. 45.—HUMAN EMBRYO, WITH UMBILICAL VESICLE, ABOUT THE FIFTH WEEK. (After Dalton.)

portions of the mesoblast which separate themselves by cleavage; the rest of the membrane enters into the formation of the *abdominal plates*. As previously stated the mesoblast separates into two layers, which are continuous at their inner borders, subsequently forming the mesenteric folds. The opposite borders of the innermost of these layers curve towards each

other, and eventually unite, forming the intestinal canal; the hypoblast, which lines the inner layer of the mesoblast, also enters into the formation of the intestine. The whole of the blastodermic vesicle (ovum) is not included in the formation of the intestinal canal. By the union of the innermost layer of the mesoblast a portion of the vitellus, larger than that portioned off to form the intestine, is separated from the embryo, and forms the *umbilical vesicle*, which soon becomes so distinct as to be connected with the embryo by means only of a cord (fig. 45), which is traversed by the vitelline duct and the omphalomesenteric artery and vein, the artery and vein being derived from that portion of the internal blastodermic laminæ which surrounds the umbilical vesicle. The remains of the vitellus contained in the umbilical vesicle form a reserve of nutrient matter, which is conveyed by the vitelline duct to the developing tissues of the embryo; after this reserve is exhausted, the umbilical vesicle, vessels, and ducts are obliterated; this occurs before the end of the fourth month. The epiblast and the outer layer of the mesoblast curve forwards and inwards, and unite enclosing the intestine; thus there is formed a tube within a tube—the inner tube is the embryonic intestinal canal, the outer one is the pleuroperitoneal cavity, which is subsequently divided by the diaphragm into abdomen and thorax. The next step is the formation of the *amnion* and the *allantois*.

On all sides of the embryo, at a little distance from it, folds of the epiblast and inner layer of the mesoblast arise and curve over the embryo until it is entirely enclosed by the junction of these *amniotic folds*. These folds are necessarily duplex, that is, each fold consists of a double layer of epiblast and mesoblast. On their junction over the dorsum of

the embryo, the processes of the outer fold fuse together as also do the processes of the inner fold ;



Fig. 46.—HUMAN OVUM AT END OF THIRD MONTH, SHOWING PLACENTAL POSITION OF THE CHORION FULLY FORMED. (After Dalton.)

the septum which would naturally result from the union of folds of a double membrane is absorbed, and two separate cavities are formed—one between the outer and the inner layers, and the other within the inner layer ; the latter is the amniotic cavity, and within it lies the embryo. The external fold subsequently fuses with the vitelline membrane and forms

the chorion—the external envelope of the ovum. The amnion, a tough fibrous membrane, is lined with a single layer of pavement epithelium, and resembles a serous membrane except in being non-vascular. At the spot where the umbilical cord enters, the amnion is continuous with the integument of the foetus, forming a closed sac in which is contained the *liquor amnii*. This fluid at first is clear and limpid, with a specific gravity little higher than that of water ; as pregnancy advances it becomes turbid and slightly viscid, the specific gravity increasing a little. It contains albumen, urea, fatty matters, and small quantities of the phosphates and chlorides of calcium, sodium, and potassium. The quantity of liquor amnii increases during the period of utero-gestation, being most abundant in proportion to the size of the embryo, about the third month ; the actual quantity at full term varies from a few ounces to several pounds. The amniotic fluid is supposed by some to be derived from the foetus ; according to Priestley it

is secreted from the epithelial cells lining the amnion; the last is probably the true explanation. The uses of the liquor amnii are to preserve the foetus from external violence and from direct pressure of abnormal uterine contractions during utero-gestation; to allow some degree of movement to the foetus; to preserve an equable temperature; and, during labour, to form an elastic wedge for dilatation of the os uteri. The space



Fig. 47.—OUTLINE OF HUMAN EMBRYO OF ABOUT THREE WEEKS.

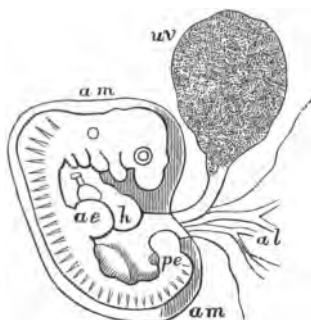


Fig. 48.—OUTLINE OF HUMAN EMBRYO OF ABOUT FOUR WEEKS.

am, Amnion. uv, Yolk-sac. al, Allantoid pedicle. ae, Anterior extremity. pe, Posterior extremity. h, Heart. (After Allen Thomson.)

between the amnion and chorion is at first occupied by a gelatinous substance, traversed by fine transparent filaments, called the *corps réticulé*, of Velpeau: as the amnion enlarges this gelatinous substance is absorbed. Occasionally fluid is present between the amnion and chorion, which, by escaping during the early stage of labour, may give rise to an erroneous impression that the "waters have broken," whilst the amnion is still intact.

The *Allantois* springs from the lower part of the intestinal canal of the embryo and spreads out into the cavity left vacant by the formation of the

amniotic folds. At first it consists of a membranous vesicle, derived from the epiblast and the inner layer of the mesoblast, continuous with the cavity of the intestine, containing blood-vessels communicating with

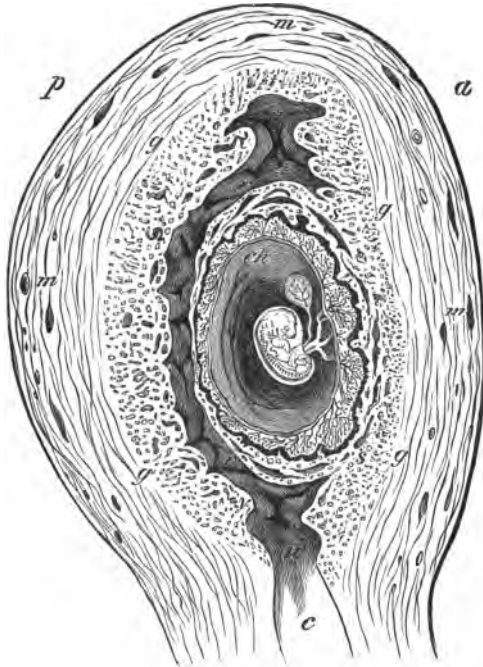


Fig. 49.—SEMI-DIAGRAMMATIC OUTLINE OF AN ANTERO-POSTERIOR SECTION OF THE GRAVID UTERUS AND OVUM OF FIVE WEEKS. (After Allen Thomson.)

*a*, Anterior uterine wall. *p*, Posterior uterine wall. *m*, Muscular substance of wall. *v*, Decidua vera. *g*, Glandular layer. *r*, Decidua reflexa. *u*, Uterine cavity. *s*, Decidua serotina. *c*, Cavity of cervix uteri. *ch*, Chorion, with its villi. *e*, Embryo enclosed in amnion, with the allantoic vessels passing into the placenta, and the umbilical vesicle.

the intestinal circulation. In process of development

the allantois divides into two parts, united by a pedicle, the foetal segment forming the rudiment of the urinary bladder; the outer segment advances by degrees, and spreads out until it entirely surrounds the embryo, its cavity having been obliterated by the walls of the vesicle coming in contact and joining, forming a vascular membrane instead of, as at first, a membranous sac or vesicle; it then fuses with the chorion, forming the *endo-chorion*, the outer layer constituting the *exo-chorion*. This duality is, however, more hypothetical than real, as the chorion is only a single membrane. After the allantois has united with the chorion a number of villi rapidly develop on the chorion, and these penetrate into and intimately connect themselves with the decidua reflexa, forming the channel of nutrition to the embryo during its early stages of development. At first these villi are homogeneous in structure; afterwards they branch out and contain nuclei; later on vessels from the chorion penetrate them in loops and thus render them capable of absorbing nourishment for the embryo. About the end of the second month all the villi, except those in contact with the decidua serotina, disappear, being no longer required; those connected with the decidua serotina continue to develop and eventually form part of the placenta. The pedicle of the allantois at first contains two arteries and two veins, one of the veins afterwards atrophies. The two arteries and the remaining vein along with the vitelline duct, subsequently enter into the formation of the umbilical cord. When the abdominal walls of the fœtus close round the cord, that portion of the pedicle of the allantois within the foetal abdomen develops into the urinary bladder and is in temporary communication with the umbilicus. Before birth the portion of the pedicle between



bladder and umbilicus becomes impervious, and in that state persists to adult life, when it may be recognised as the *urachus*, a fibrous cord which connects the bladder to the umbilicus.

The outer envelope of the ovum has thus been built up of three distinct formations—first the vitelline membrane, then the outer amniotic fold, and lastly the allantois, the whole being called the *chorion*.

At the time of formation of the decidua reflexa the chorion is in the stage of development just de-



Fig. 50.—SECTION OF GRAVID UTERUS ABOUT THE FIFTH MONTH.

scribed when non-vascular villi are distributed over the whole of its external surface. These villi insert themselves into the inter-glandular portion of the thickened and highly vascular uterine mucous membrane, and so intimately connect themselves with the decidua that the membrane cannot be separated from the ovum without tearing the villi more or less. The changes previously described in the structure and arrangement of the villi then take place, and the vascular tufts forming the origin of the placenta

ramify in the uterine mucosa. The uterine capillary network surrounding the villi also increases to a great extent, and furnishes a complicated interlacement of vessels which expose a very extended surface to the follicular walls. It must be borne in mind that a double layer of epithelium exists between the vascular loops of the chorion and the capillary network of the decidua, namely, that of the investing membrane of the villi and that of the walls of the uterine capillaries, through which all interchange between the foetal and maternal circulation takes place.

The next step, the formation of the placental sinuses is still *sub judice*; some consider that it is effected by the coalescence of the network of vessels surrounding the foetal villi and the absorption of their walls at the points of junction, so as to leave, in place of a number of tortuous canals, single cavities occupying the entire thickness of the placenta. According to Professor Turner the placental sinuses are enormously dilated maternal capillaries, with walls of excessive tenuity, into which the foetal villi project; in addition to its proper epithelial covering each villus is covered with a layer of cells derived from the decidua, and which can be readily separated from the cells surrounding the villi. Professor Turner believes that these cells secrete nourishment from the maternal blood, which is taken up by the terminals of the chorion for the nutrition of the foetus. This relation is maintained to the last, the foetal never emptying directly into the maternal circulation. The foetal blood then eliminates its impurities and obtains its oxygen by passing through capillary loops which are bathed by the maternal blood. The maternal supply is received from the curling arteries of the uterus, and is returned to the

systemic circulation by the uterine veins, which emerge at a very acute angle to the uterine walls so as to facilitate closure when the placenta is detached. The existence of the placental sinuses, first described by Hunter, is denied by several investigators—for example, by Dr. Braxton Hicks, who, in a paper on “the Anatomy of the Human Placenta,” published in the *Transactions* of the Obstetrical Society of London

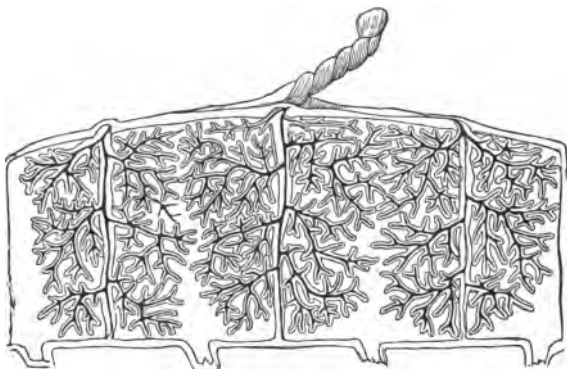


Fig. 51.—VERTICAL SECTION OF PLACENTA. (After Dalton.)

for 1872, very acutely controverts this view, and enters minutely into the arguments both for and against it. Dr. Hicks holds that only capillary spaces exist between the placental villi, and that, although the intervillar space is continuous throughout the placenta, it has no communication with the uterine arteries or veins, and therefore in its normal condition does not contain blood. Dr. Hicks objects to the ordinary methods used to demonstrate the existence of the sinuses, such as injections from the maternal side, and the passing of probes or bristles, because the exquisitely delicate membranous walls are ruptured by such treatment. He states, however,

that when water is injected into the intervillar space of a detached mature placenta, the fluid permeates the entire organ and escapes colourless from any fissures accidentally existing in the serotina, or other artificial openings, but does *not* return through either *artery* or *vein*; the colourless condition of the water after passing between the villi going to prove the absence of blood, and its refusal to return by artery or vein seeming to point to want of continuity between these vessels and the intervillar space. Dalton, who adheres to the Hunterian view, states that on four different occasions he has taken an undelivered uterus, and after removing the child, has placed the womb under water with the placenta still adherent, and, by means of a blowpipe, has gently blown into a uterine vessel until air found its way throughout the whole extent of the intervillar space. The value of the experiment entirely hinges upon one point—Did the air find its way between the villi *per vias naturales*? Or was the pressure sufficient to cause rupture of the barriers, which the opponents of the sinus theory hold to exist between the uterine circulation and the intervillar space?

The placenta in various forms is found in all mammals; in the human subject it takes the shape of a more or less circular cake of meniscus form, the convex surface being applied to the uterus, leaving the foetal surface slightly concave. An average placenta measures about eight inches in diameter and an inch or more in thickness at the centre, the peripheral portion being thinner. At the point of insertion of the umbilical cord the umbilical vessels are seen to radiate over the placenta in all directions. The amnion and chorion are reflected over the placenta on to the uterine parietes, and in a recently detached placenta a delicate membrane is seen to

cover the entire maternal surface; this is the inner lamina of the decidua serotina, the outer layer remaining attached to the walls of the uterus. The placenta with the membranes, conjointly known as the *secundines*, are expelled from the uterus after the birth of the child. Communication between placenta and foetus is effected by means of the *umbilical cord*, which is originally derived from that portion of the

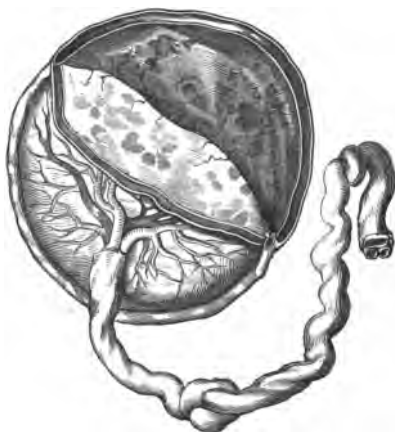


Fig. 52.—THE UMBILICAL CORD AND EXTERNAL SURFACE OF THE PLACENTA.  
THE AMNION AND CHORION RAISED FROM ONE PORTION OF THE PLACENTA.

allantois extending from the foetal abdomen to the maternal membranes. The cord varies in length from six or eight inches to almost as many feet; when unusually long it is frequently found encircling the neck of the foetus, and sometimes is knotted on itself, a condition caused, perhaps, by the foetus floating through a loop of the cord during the earlier months of pregnancy when the amniotic cavity is large in proportion to the size of the child. On

account of the elastic structure of the cord and the protection afforded by the gelatinous envelope, these knots rarely interfere with the foetal blood supply. The maternal end of the cord is usually inserted into the centre of the placenta, though it springs occasionally from one side, forming what is called "battledore placenta." The cord consists of one vein, without valves, and two arteries enclosed in a quantity of

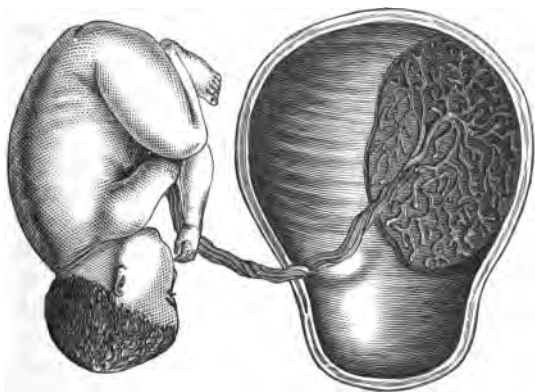


Fig. 53.—ATTITUDE OF THE FŒTUS *in utero*, AND INSERTION OF THE PLACENTA. (After Schultze.)

gelatinous substance—the gelatine of Wharton—and is covered over by a layer of both chorion and amnion. In the early stage the vessels are straight, but afterwards the arteries become twisted round the vein, the direction of the spiral being almost invariably from left to right. No satisfactory explanation of this phenomenon can be given.

Having followed the track of the blood from the maternal system as far as the foetus, a description of the course the blood takes within the foetus is now required to complete the subject. When the umbilical

vein arrives within the foetal abdomen, it divides into two branches, one to supply the liver, and the other, the ductus venosus, passes directly to the inferior vena cava. The oxygenised blood from the placenta on entering the inferior cava becomes mixed with the impure blood from the lower extremities and flows into the right auricle, and thence through an opening in the auricular wall peculiar to intra-uterine life, called the foramen ovale, into the left auricle, thence into the left ventricle, and on into the aorta, whence it is distributed by the carotid and sub-clavian arteries to the head and upper extremities, to be returned by the superior vena cava to the right auricle, and propelled into the right ventricle, whence it passes into the pulmonary artery. As the lungs are all but impervious, the bulk of the blood traverses a special channel provided for this pulmonary condition, called the ductus arteriosus, into the descending aorta, and is carried to the lower extremities to be returned to the placenta by the hypogastric arteries. Attached to the anterior wall of the inferior cava, at its cardiac extremity, is a thin membranous curtain called the Eustachian valve, which performs the double function of directing the current from the ascending cava through the foramen ovale into the left auricle, and the stream from the descending cava into the right ventricle. The first act of respiration, on the child's birth, opens up the pulmonary circulation, and thus allows the blood from the right ventricle to pass through the lungs, whence it is returned into the left auricle; the circulation through the umbilical arteries is simultaneously stopped, causing all the blood from the lower extremities to return by the inferior cava into the right auricle. The supply from the umbilical vein also ceases. These modifications of the circulation obviate the necessity for the ductus

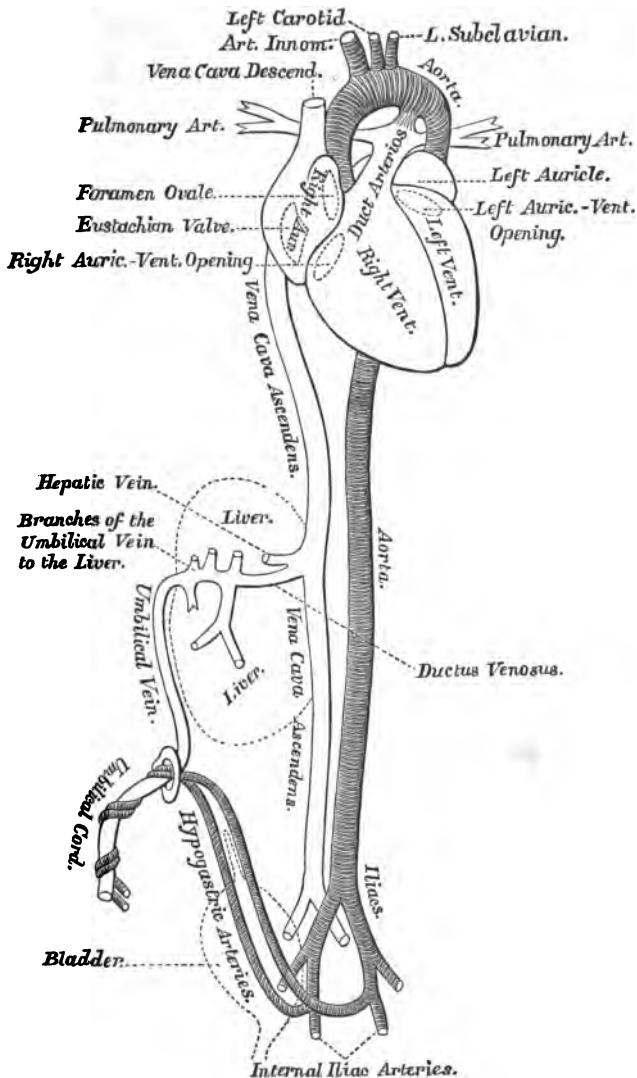


Fig. 54.—DIAGRAM OF THE FETAL CIRCULATION. (After Flint.)



arteriosus and venosus, which accordingly become obliterated, the foramen ovale gradually closes, and independent circulation is established.

*The development of the fœtus* may be briefly described in monthly stages, so as to meet the requirements of the obstetrical student.

First month.—The embryo measures about  $\frac{1}{8}$ th of an inch in length, and consists of a gelatinous, transparent mass without trace of foetal structure; the amnion is fully developed, the allantois has reached the chorion, the umbilical vesicle is large, and the umbilical cord is straight.

Second month.—Length between  $\frac{1}{2}$  and  $\frac{3}{4}$  of an inch; head and extremities apparent; eyes appear as black dots; Wolffian bodies and liver large; incipient formation of heart, lungs, and of organs of generation; abdominal walls closed in front; points of ossification visible in clavicle and lower jaw; the umbilical vesicle is reduced in size; the umbilical cord is longer, but still straight. The entire ovum is about the size of a hen's egg.

Third month.—Length from  $2\frac{1}{2}$  to 3 inches; weight about 1 ounce; head disproportionally large; pupillary membrane formed; glandular organs of abdomen appear; traces of fingers; umbilical vesicle and allantois absorbed; placenta distinct, and umbilical cord begins to be twisted; the sexual organs are not differentiated.

Fourth month.—Length 5 to 6 inches; weight 5 to 6 ounces; eyes, mouth, and nostrils closed; muscles contractile; cerebral convolutions become manifest; gall-bladder develops; the sex can be determined; fontanelles and sutures widely open; traces of ossification in frontal, occipital, and mastoid bones; the umbilical cord acquires the gelatine of Wharton.

Fifth month.—Length 9 to 10 inches ; weight 8 to 10 ounces ; hair commences to appear on the head ; liver secretes bile, and meconium is found in the intestinal canal ; nails begin to form ; ossific points may be seen in the ischia.

Sixth month.—Length 11 to 13 inches ; weight about 1 pound ; eyelashes formed ; cranial bones ossified, but sutures and fontanelles still open ; ossific points in pubic bones : the deposition of fat commences in the subcutaneous areolar tissue ; the testicles have not descended ; the eyelids are open.

Seventh month.—Length 14 to 15 inches ; weight 3 to 4 pounds ; hairs longer and darker ; skin covered with sebaceous matter ; fat present under the skin ; pupillary membrane disappearing ; testicles have descended ; the foetus is now capable of a separate existence, or, in other words, is viable.

Eighth month.—Length 15 to 18 inches ; weight 4 or 5 pounds ; cornea clear ; pupillary membrane has quite disappeared.

Ninth month.—Length 19 to 20 inches ; weight 5 to 10 pounds. Cases are recorded where the latter weight has been exceeded by 6 or 7 pounds.

As an aid to the memory in every-day practice it is convenient to note the following numerical relations :—In the third and fourth months the number of inches measured by the foetus are, roughly speaking, equal to the number of the months ; in the fifth, sixth, seventh, and eighth months the number of inches are equal to double the number of the months.

## CHAPTER VI.

## THE GRAVID UTERUS.

THE unimpregnated uterus can scarcely be regarded as fully developed, inasmuch as amongst its ultimate elements it contains cells and muscular fibres capable, under the appropriate stimulus, of extended growth and development; but if the stimulus is withheld, these elements remain for any length of time in a latent, undeveloped condition. The most remarkable feature in the gravid uterus is its rapid and great expansion; before impregnation it is about  $2\frac{1}{2}$  inches long, and weighs about  $1\frac{1}{2}$  ounce; at the ninth month of pregnancy it measures 12 inches in length, and weighs, immediately after delivery, about 2 pounds. During the two or three first months of pregnancy the uterus maintains the shape of its unimpregnated state, but it gradually becomes more spherical; after the third month and later on, the perpendicular diameter increases in greater proportion than the transverse, causing the organ to assume the characteristic ovoid form of the later months of pregnancy. At first the walls increase a little in thickness, but afterwards they become thinner; when on section the outline of the cavity corresponds with the external contour of the organ.

As the uterus increases in size the cervix appears to project less into the vagina. The usual explanation of this change is that the cervix becomes drawn up

and absorbed, so to speak, into the uterine body. So long ago as 1826 Holtz, and more recently Drs. Farre and Duncan have shown that the cervix maintains its normal length until the last two weeks of pregnancy, when it does undergo shortening—the result of incipient, painless uterine contractions. In the unimpregnated uterus the cervix is firm and hard; in the pregnant state the cervix is relaxed, infiltrated, and softened, so that by the seventh or eighth month it is scarcely distinguishable from the vaginal walls. There is therefore no real shortening or obliteration of the cervix until the period immediately preceding labour. At the early period of pregnancy, owing to its increased weight, the uterus sinks somewhat into the pelvis; and cannot be felt through the abdominal walls; but about the third or fourth month its fundus emerges from the pelvis, reaches the umbilicus about the sixth month, and continues to rise, until at last it attains the level of the ensiform cartilage.

In its ascent the uterus is directed at first by the axis of the pelvic brim upwards and forwards; afterwards this position is maintained by the sacral promontory and the symphysis pubis, so that the womb lies immediately behind the abdominal walls, and is thus placed in the best position for the avoidance of pressure, either on the bowels, inferior cava, or aorta.

The actual increase in bulk of the uterine walls is due mainly to hypertrophy of the muscular coat, the peritoneal envelope simply enlarging so as to keep pace with it; the mucous lining, however, by developing into the decidua, adds somewhat to the entire thickness of the walls. The muscular coat of the uterus consists of three layers, described when treating of the unimpregnated organ, but these are more

strongly defined in the gravid state. The internal layer, arranged concentrically around the opening of each Fallopian tube, and in a circular direction round the body, is thin; the middle layer is thicker and interlaces in all directions; the external consists of transverse and longitudinal fibres; the transverse fibres, found principally on the anterior and posterior surfaces, surround the entire organ, and merge into the round, broad, and ovarian ligaments. The direction of these various fibres, however, is not so manifest in the recent state as many of the diagrammatic representations would lead us to believe.

In speaking of the unimpregnated uterus, reference was made to the existence of small fibre cells and nuclei in the muscular coat; now it is to the enlargement of the fibre cells into smooth muscular fibres of colossal size, and the development of new cells into first the small and then the large fibres, that this hypertrophy of the muscular coat is due. According to Kölliker this transformation takes place up to the sixth month, after which period none but the colossal fibres are to be found. The blood-vessels of the gravid uterus are considerably enlarged, the veins obtaining a muscular coat developed from embryonic cells pre-existing in their middle tunic. The veins supplying the placenta are, however, less amply furnished than the rest of the uterine veins.

The question whether, in the gravid uterus, an actual augmentation of nerve supply takes place is a contested point. Dr. R. Lee, amongst a number of other disputants, holds that the uterine nerves increase in bulk during the gravid state; on the other side, Dr. Snow Beck asserts that there is no increase of nerve tissue. Dr. Snow Beck in his dissections removed the neurilemma from the nerves of the gravid womb, and then compared the fine nerve

fibres with those of the unimpregnated organ, and found that no increase in size had taken place. It is now generally admitted that any apparent increase in the size of the nerves is due solely to enlargement of the neurilemma, which is merely fibrous tissue, and is neither a "generator nor a conductor" of nerve force.

— *Involution of the Uterus.*—The uterus after delivery occupies the whole of the pelvic cavity, and is reduced to about eight inches in length, the thickness of its walls being one inch: its interior, as far as the internal os, is devoid of mucous membrane, but that of the cervix is retained. That portion of the uterine wall which gives attachment to the placenta is nodulated, and exhibits the obstructed openings of the large placental veins.

The first step towards the diminution of bulk is the contraction of the muscular fibres; then about the end of the first week fatty degeneration ensues in the substance of the large fibres which gradually undergo absorption. At the end of the fourth week nucleated cells make their appearance and develop into new muscular fibres, replacing the effete structure about the end of the second or third month. The remains of the decidua are broken up by fatty degeneration and pass away in the lochia, and at the end of the first month the new mucous membrane begins to develop. The epithelium cilia first, and afterwards the utricular glands are renewed, and are completed about the ninth or tenth week, when the whole organ resumes its normal condition.

— *Fœtus in Utero.*—The entire fœtal attitude is that of flexion. At the end of pregnancy the spine is curved forwards, the chin resting on the sternum, the thighs flexed on the trunk, the knees bent, and the arms crossed over the front of the chest, the head being the most dependent part. This arrangement

of the trunk and limbs gives to the foetus an ovoid outline which is well adapted to the uterine cavity, and presents it in the most favourable position for passing through the maternal pelvis.

It used to be held that when once the foetus had taken up its position, this was maintained until delivery; but repeated examinations have revealed that in the majority of cases changes of position take place from time to time, that they occur more readily during the earlier months, are most frequent in multiparæ, and are often caused by contracted pelves.

The reason why the head presents, in the great majority of cases, has been variously accounted for, the most practical explanation being that it is determined by *gravitation*, aided by the *form* and *inclination* of the uterine cavity. A series of experiments were made by Veit, who placed a foetus in a spheroidal vessel of salt water, of specific gravity identical with that of the foetus, when it was found that its head gravitated lower than its breech, there being also a downward inclination of the right shoulder, which was accounted for by the position of the liver. Dr. Matthews Duncan found that the specific gravity of the detached head exceeded that of the trunk, and by a number of other experiments and logical deductions therefrom has considerably developed the gravitation theory. The shape and inclination of the uterine cavity, as was previously remarked, exert considerable influence. When a woman is in an upright position, the anterior wall of the uterus forms an angle of  $35^{\circ}$  with the horizon, down which incline the foetus has a tendency to slide, checked, however, by the cervix and closed os. If the woman is placed on her back, still the uterus is in an inclined position, its angle with the horizon being now  $55^{\circ}$ , so that whether the

woman is standing or lying on her back (the superior gravity of the head being allowed) the foetus will naturally present with its cephalic extremity towards the os, impelled thereto partly by gravitation partly by the inclination of the uterine walls. When the mother lies on either side the uterus is horizontal, which would leave the position of the foetus unaltered in its relation to the womb; but, as Schroeder observed, if the fundus is tilted over toward the side on which the woman lies, the foetus, obeying the laws of gravity, would reverse its position, and a breech presentation would result. This, however, could take place only during the earlier months when the cavity of the uterus is larger in proportion to the size of the foetus. Sir James Simpson endeavoured to account for the position of the foetus by reflex action; but we are inclined to prefer the foregoing simpler explanation to his ingenious theory.

The various processes of development of the uterus and foetus at length completed, the time comes for the final act of the generative function—the expulsion of the foetus. The body of the uterus, it will be remembered, receives its nervous supply from the sympathetic, the cervix only being supplied by the spinal system. Labour, from its initiatory phase to its full development, is the result of reflex action. For some time previous to the completion of pregnancy the decidua becomes separated from the uterine walls, with the exception of that portion of it to which the placenta is attached, the *decidua serotina*. This detachment is brought about by fatty degeneration, followed by absorption, thus producing solution of continuity, and placing the foetus and its membranes in the position of a foreign body in the uterus. Irritation of the uterine nerves is then set up, to be by them transferred to the sympathetic ganglia, and



thence reflected in the form of motor activity to the muscular coat of the uterus.

When once the requisite amount of nervous tension is established, a discharge follows in the shape of uterine contraction, succeeded by a period of repose ; after a time renewed irritation reproduces nervous excitation, which again culminates in a fresh discharge of nerve force, to be followed, as before, by a period of rest. These alternations of energy and quiescence succeed each other with increasing rapidity, and by degrees assume an inverse ratio towards each other, the contractions becoming longer and the intervals shorter. The diaphragm and abdominal muscles are now brought into play, at first in obedience to the will, but in the latter stage their movements become reflex, until at last the combined action of these co-ordinated forces effects the expulsion of the fœtus. The relation of the force brought to bear by the uterus itself, to that exerted by the abdominal muscles in the act of expulsion, has been variously estimated. Many indications, however, prove that the uterus is far more powerful ; for instance, note the futility of simple abdominal contractions to effect expulsion of the fœtus in cases of uterine inertia.

Although all uterine contraction is induced by nervous irritation, originating in the organ itself, it is not altogether independent of mental impressions. It is well known that the advent of the medical attendant, especially if a stranger to the patient, will occasionally induce temporary cessation of the pains ; other mental stimuli, on the contrary, will induce action previously in abeyance. These impressions are probably transferred to the sacral nerves which supply the cervix, and by them are communicated to the sympathetic.

The mechanism which effects the dilatation of the os uteri during labour is subject to some doubt, some considering it to be entirely passive, others partly passive and partly active. When the paucity of circular muscular fibres in the cervix is taken into consideration, with the fact that individually none of these fibres entirely surround it, but merely embrace segmental portions, it is not difficult to conceive how the excess of power from the body of the uterus forces the coniform bag of membranes in the shape of a hydraulic wedge between the lips of the os, and gradually distends it until the longitudinal fibres are brought into play, which then render great assistance by contracting in the direction of the fundus, and thus drawing up the os over the presenting part of the foetus.

## CHAPTER VII.

## MECHANISM OF LABOUR.

UNDER the designation *Mechanism of Labour* are comprehended the various movements and changes in position assumed by the foetus in its relation to the maternal pelvis during labour. It is the basis of a scientific knowledge of the act of parturition, and it is of high importance to the student thoroughly to comprehend this mechanism, for a mastery of it will lift him above the level of a mere midwife.

*Presentation.*—By this term we simply mean that portion of the foetus which comes foremost in the preliminary stage of labour. Presentations are divided into *Natural* and *Faulty*. Natural presentation comprehends cranial, breech, knee, and footling cases. Faulty presentations include all other varieties. Either end of the foetus may present, and delivery ensue; but when the transverse diameter presents, delivery is impracticable until the faulty presentation is rectified.

The cranial is by far the most frequent presentation, so that by patients and nurses it is usually spoken of as *the* natural presentation; in a breech presentation, on the contrary, the same authorities are wont to say that the child “comes the wrong way.”

Before describing the various cranial presentations, we will give a short description of the anatomy of the foetal head. The foetal skull (figs. 55-6-7) is oval in

shape; the cranial bones are soft, and separated from each other by membranous divisions called sutures, which serve as important guides in determining the head's position during labour. This absence of rigid bony union admits of considerable compression and modification of the shape of the head during parturition. The principal sutures are the sagittal, coronal, and lambdoidal. The *sagittal* suture extends from the superior angle of the occipital bone to the root of the

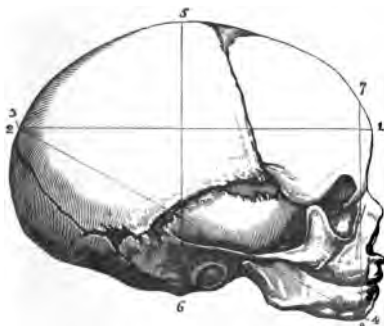


Fig. 55.—1 and 2. Occipito-frontal diameter. 3 and 4. Occipito-mental. 5 and 6. Cervico-bregmatic. 7 and 8. Fronto-mental.

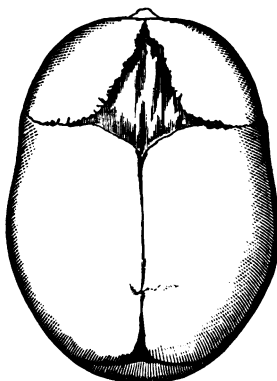


Fig. 56.—ANTERIOR AND POSTERIOR FONTANELLES.

nose. It separates the two parietal bones, and in the foetus marks the division of the frontal bone into two equal parts.

The *coronal* suture separates the frontal from the parietal bones, and extends between the greater wing of the sphenoid bone on each side.

The *lambdoidal* suture separates the superior edge of the occipital bone from the posterior edge of the two parietal bones.

There are two *fontanelles*—the *anterior*, quadran-

gular in shape, situated at the junction of the frontal and parietal bones; the *posterior*, of a triangular form,

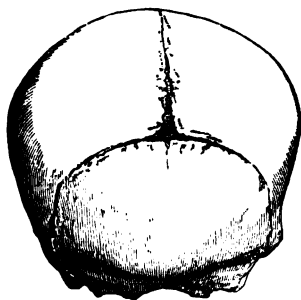


Fig. 57.—BI-PARIETAL DIAMETER; SAGITTAL AND LAMBDROIDAL SUTURES, WITH POSTERIOR FONTANELLE.

is situated at the junction of the parietal and occipital bones, and is often wanting in a full-grown, well-ossified foetus. A knowledge of the shape and topography of these fontanelles is essential to enable us to discriminate the relative position of the head to the pelvis.

The dimensions of the child's head, like those of the pelvis, should be accurately known. Dr. Murphy gives the measurements of the foetal head in a form easy of reference.

Longitudinal.	Measurements.	Transverse Measurements.
In.	In.	In.
Occipito-Bregmatic . . . 3½	Mento-Bregmatic . . . 4	Bi-parietal . . . 3½
Occipito-Frontal 4½	Mento-Frontal 3½	Bi-temporal . 3
Occipito-Mental 5½	Mento-Occipital 5½	Bi-zygomatic 3½-4

The head may present in four different ways. First and oftenest, the occiput points to the left acetabulum, and the forehead to the right sacro-iliac synchondrosis. Second, the occiput points towards the right acetabulum, and the forehead to the left sacro-iliac synchondrosis. In these two forms it will be observed that the *occiput* is directed towards the pubes of the

mother ; in the next two the *forehead* takes this direction. Thus, in the third cranial presentation, the occiput points where the forehead points in the first—to the right sacro-iliac synchondrosis, and the forehead to the left acetabulum. In the same manner, the fourth is the converse of the second—the occiput pointing to the left sacro-iliac synchondrosis, and the forehead to the right acetabulum.

*First position.*—Before the head reaches the pelvis



Fig. 58.—HEAD ENTERING THE PELVIS IN FIRST POSITION.

its long diameter is parallel to the brim ; on entering the pelvis, however, it flexes and assumes what is called the occipito-frontal obliquity, with the occiput directed downwards, and the chin bent on the sternum. This position naturally results from the junction of the vertebral column and head being much nearer the occiput than the chin. On the application of the expulsive force from above, the

resistance being below, the upper portion of the spine flexes until the chin rests on the sternum, thus steadying the head and affording another point for the transmission of force to the presenting part.

Whilst the head is in this position, an examination reveals that the right *tuber parietale* is the most prominent part. According to Naegelé the head enters the brim obliquely, the right parietal bone being much lower than the left; more recent authorities



Fig. 59.—HEAD WITHIN THE PELVIC CAVITY—FIRST POSITION.

deny this lateral obliquity and agree that the head enters the brim with both parietal bones in the same plane. The sagittal suture traverses the pelvis in the right oblique diameter, dividing the os uteri unequally, more of the right than the left parietal bone presenting, and on this spot is formed the primary caput succedaneum, or scalp tumour, from pressure of the head on the os uteri during dilatation. When the os is well dilated, the sagittal suture may be traced forwards and downwards (the mother being on her left side) to the posterior fontanelle and lamb-

doidal suture, and backwards and upwards to the anterior fontanelle.

As the head advances its position changes, its long diameter gradually assuming a parallelism with the conjugate (or antero-posterior) diameter of the pelvis, the forehead lodging in the hollow of the sacrum, and the occiput being turned towards the pubes. The rotatory process is facilitated by the two inclined planes, formed by the front of the left ischial spinous



Fig. 60.—HEAD PASSING UNDER PUBIC ARCH—FIRST POSITION.

process and the obturator muscle on the one part, and the sacro-sciatic ligaments on the other. The occiput is prevented from rotating in an opposite direction by the left ischial spine, and the forehead by the right ischial spine, so that when expulsive force is applied from above, the head is compelled to move along these two inclined planes, with a twisting or screw-like motion, and passes into the position above described. This movement of the head may be readily



observed by keeping the finger in contact with it during two or three pains. It will be found that during a pain rotation takes place in one direction, and as the pain subsides the rotation is reversed, the head returning somewhat to its former position; these alternations going on until at last the head glides into its new position. Before rotation is quite effected the chin leaves the sternum, and the frontal portion of the head advances beyond the occiput, thus reversing the previous position. The presenting part is now



Fig. 61.—EMERGENCE AND EXTENSION OF THE HEAD—FIRST POSITION.

the posterior and superior quarter of the right parietal bone, and here the secondary caput succedaneum is formed from pressure on the vaginal orifice. The occiput is now wedged against the pelvic arch, and remains stationary until the forehead and face descend along the perineum, pressing against the coccyx, which, yielding about an inch, enables the head at last to emerge under the pubic arch; this process is called the movement of *extension*. To the last the head maintains a certain amount of obliquity towards the

right, the first part to escape being the upper and posterior part of the right parietal bone.

The shoulders have now to undergo a similar rotation (but *reverse* in direction to that of the head), produced in precisely the same manner, by the spine of the ischium and sacro-sciatic ligaments. The right shoulder glides along the anterior surface of the right ischial spine, and passes forward under the arch of the pubis, and rests there whilst the left



Fig. 62.—HEAD WITHIN PELVIC CAVITY—THIRD POSITION.

shoulder sweeps along the perineum, as did the face when the head was undergoing expulsion ; this causes the head to revert to the first position, and is called the movement of *restitution*. The objects fulfilled by these various movements of the foetal head may be thus summed up:—Flexion (occipito-frontal obliquity) is the means of always presenting the shortest diameter of the head to the pelvic canal ; extension causes the head to advance along the curved passage of the pelvis ; rotation and restitution place the foetus in favourable relation to the varied diameters of the pelvic brim and outlet.

*Second Position.*—This being merely the converse of the first position, it will be needless again to go through the details, all that has been said about the first position being applicable equally to the second, bearing in mind, however, that the direction of the head's occipito-frontal diameter when within the brim is in the left instead of the right oblique diameter of the pelvis.

*Third position.*—It has been pointed out that the head in this position presents in a reverse direction to



Fig. 63.—HEAD PASSING UNDER PUBIC ARCH—THIRD POSITION.

that which takes place in the first and second positions, that is, with the forehead forwards, the consequence being that the mechanism of this class of labours presents more difficulties than are met with in the former class.

When the head enters the brim it is found that the sagittal suture traversing the pelvis in the right oblique diameter may be traced downwards and forwards to the anterior fontanelle, and upwards and backwards

to the posterior fontanelle; the difference in the situation of the fontanelles (the posterior being generally the lower) is a means of diagnosing this position.

Labour may here terminate in two ways—either by the forehead remaining towards the pubes, expulsion taking place in this position, or by the occurrence of rotation into the second position, with the forehead towards the left sacro-iliac synchondrosis, and the occiput towards the right acetabulum.

If the head passes down so that the occiput takes up a position behind the right ischial spine, this part presents a barrier over which the occiput cannot pass, so that rotation is impossible, and the head is compelled to descend unaided by the screwing movement,

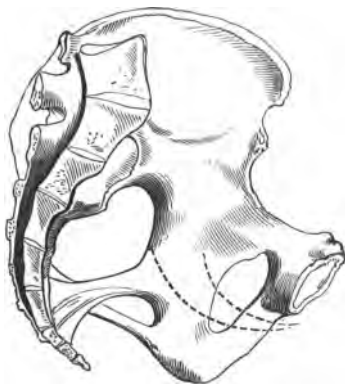


Fig. 64.—OUTLINE OF THE INTERNAL SURFACE OF THE LEFT HALF OF THE PELVIS. The two curved lines mark the path of the head in the first, and in the occipito-anterior termination of the fourth positions.

the forehead, face, and chin passing under the pubic arch, and the occiput passing along the sacrum and perineum.

The more usual course, however, in the third pre-

sentation is for the occiput to descend in *front* of the right ischial spine, and to move along its anterior surface, the forehead being at the same time directed by the sacro-sciatic ligaments into the second position. When the occiput descends freely (the anterior fontanelle being out of the reach of the finger), the position is favourable for rotation; if, however, the forehead continues to descend, it is probable that delivery will take place in the manner first described.

Bearing these facts in mind, it is sometimes possible to assist in inducing rotation by pressing up the brow towards the ileo-pectineal line, so that the forehead may ride over the left ischial spine whilst the occiput passes under the spine of the opposite side.

*Fourth Position.*—This position bears a like relation to the third that the second does to the first, the occipito-frontal diameter of the head presenting in the left oblique diameter with the anterior fontanelle towards the right acetabulum. In this position rotation is considered to be more difficult on account of the rectum diminishing the left oblique diameter of the pelvis.

With regard to the relative frequency of the various cranial presentations, it appears from statistical observations that the first and third are far the most frequent, the second and fourth occupying a very much lower percentage rate. Leishman gives, as average numbers :—

First Position.	Second Position.	Third Position.	Fourth Position.
67·03	9·52	20·92	2·52.

## CHAPTER VIII.

MECHANISM OF LABOUR—*Continued.*

*Face Presentations.*—These are also divided into four classes :—

<i>First</i> , Face in right oblique diameter of pelvis . . .	} Forehead forwards.
<i>Second</i> , Face in left oblique diameter of pelvis . . .	
<i>Third</i> , Face in right oblique diameter of pelvis . . .	} Forehead backwards.
<i>Fourth</i> , Face in left oblique diameter of pelvis . . .	

These presentations differ from cranial presentations in extension of the head having taken the place of flexion ; this extension brings the face into the presenting position instead of the vertex. If the formation of the face is considered in relation to the pelvis, it is obvious that in face presentations the chin will naturally occupy the position that the occiput fills in cranial presentations ; it therefore follows that in facial presentations the natural way of delivery is for the chin to emerge under the pubic arch, and the forehead to pass along the perineum.

*First Facial Presentation.*—When the face is in this position the nose is in the right oblique diameter, the forehead looking towards the left acetabulum. Tracing the nose in the opposite direction, that is,

backwards and upwards, the mouth and chin are felt towards the right sacro-iliac synchondrosis. The nose, like the sagittal suture in the first cranial presentation, divides the os uteri unequally, the right side of the face taking the anterior and larger portion.

The presenting part is the upper portion of the right malar bone, and on it, implicating the eye, will be found the primary caput succedaneum. As the face enters the brim, the chin comes in contact with the anterior surface of the right ischial spine, which induces rotation from right to left, being opposite in direction to the rotation performed in the first cranial presentation. The forehead and cranium are now in the hollow of the sacrum, and the presenting part will be found lower down the face than before, namely, the right cheek and angle of the mouth, where the secondary caput succedaneum will be formed if the face remains long enough in this position. The chin now passes under the pubic arch, and rests against it, whilst the forehead and vault of the cranium dilate the perineum and glide along it, performing a movement of flexion in every respect analogous to the extension which takes place in the first cranial presentation when the occiput is fixed against the pubic arch. A further noticeable analogy is that the chin, like the occiput in the last-mentioned presentation, does not emerge exactly in the antero-posterior line, but slightly to the right. The shoulders rotate and emerge as in the first cranial presentation.

*Second Facial Presentation.*—The forehead here presents towards the right acetabulum, and the chin towards the right sacro-iliac synchondrosis, the mechanism being identical with the last described presentation save that the various positions and rotations are reversed.

*Third Facial Presentation.*—The nose will be found to be in the right oblique diameter, with the forehead towards the right sacro-iliac synchondrosis, and the left malar bone is the presenting part. The chin glides along the anterior surface of the left ischial spine under the pubic arch, whilst the forehead and cranium pass along the perineum. This presentation and its converse, the *fourth*, are very rarely met with.

According to Churchill, face presentations occur once in every 223½ cases, and the relation that the first presentation bears to the second, according to Naegelé, is as 22 to 17. Ordinarily face presentations do not call for much in the way of active treatment, but if aid seems to be needed the finger may be introduced into the mouth and an attempt made to promote rotation forwards and downwards, so as to bring the chin under the pubic arch. The neck being bent far back puts on the blood-vessels a degree of pressure which it is advisable to relieve as soon as occasion demands; hence the forceps may be used earlier here than in cranial presentations.

*Brow presentation* is an unfavourable form of face presentation, and the presenting part being one of the frontal protuberances, the forceps will be generally required.

*Pelvic Presentations.*—Pelvic presentations are now usually included amongst the natural presentations. A contrary opinion was long held, and the earlier obstetricians used to attempt to rectify presentations of this class. Now, however, it is acknowledged that although foetal life is placed in greater jeopardy, pelvic presentations are not more riskful to the mother than cranial presentations.

The head of the foetus in utero is obviously the most bulky and unyielding part; when, therefore, in



cranial or face presentations, the head is born, the most difficult part of the task is accomplished, for now the pelvic passage of the mother is so dilated that the rest of the foetal body slides out with comparative ease. In pelvic presentations, on the contrary, the last is the most difficult stage of delivery, for although in breech presentations, with the legs flexed on the trunk, the bulk is considerable, yet these soft and compressible parts fail to dilate the canal so effectually as the passage of the comparatively hard head, so that when the cranium arrives at the outlet of the pelvis it has further to dilate the parts. Another difficulty, too, in the final stage of pelvic presentation arises from the uterus having only the head to contract on, which places it at a great mechanical disadvantage, as it can exert but feeble expulsive force. If at this stage the head does not speedily follow, the trunk compresses the cord and suffocates the child. These are the principal reasons why the foetus is so much more frequently sacrificed in pelvic than in cranial presentations.

The mechanism of pelvic presentations bears a considerable resemblance to that of cranial presentations, modified by the difference existing between the presenting parts.

Pelvic presentations may be divided into four classes, two with the foetal abdomen towards the maternal spine, and two with the foetal abdomen towards the maternal abdomen. In the first pelvic presentation the breech is in the left oblique diameter, with the left trochanter forwards, and directed towards the right acetabulum. When the os uteri is fairly dilated, the sulcus between the nates is found to be in the right oblique diameter, with the genital organs towards the right sacro-iliac synchondrosis, and the anus and sacrum to the front. It is a matter

of the greatest importance to be able to detect pelvic presentations with certainty, and although to the eye there is considerable difference between the nates and shoulder, still when only the tips of one or two fingers can be brought to bear on the exploration, the



Fig. 65.—PELVIC PRESENTATION—FIRST POSITION.

discrimination of the parts is not a little difficult: for example, in a hasty and imperfect examination, the female genital organs may be easily confounded with the margin of the axilla: if, however, the examination is conducted with adequate care, and the various parts are thoroughly identified, all difficulties may be overcome. The anus and the asperities on the back of the sacrum are specially trustworthy in the diagnosis of breech presentations. The breech in passing through the pelvis performs a rotation somewhat similar to but not so complete as that which the head undergoes in cranial presentations: this in-

complete rotation is due to the softness and compressibility of the presenting part, which adapts itself to the pelvic inclines without effecting the usual changes in position in the child's body, the result being that the trunk passes through the pelvis *nearly* but not quite in the antero-posterior diameter. When entering the brim the left hip descends lower than the right, and this relative position is maintained until the left hip reaches the pubic arch, when it is partially arrested; the opposite hip then glides along the perineum, describing the arc of a circle whose centre is the *point-d'appui* of the left hip with the pubic arch. As soon as the right hip passes through the outlet the breech descends, the legs escape, and the lower part of the trunk is born. The descent and expulsion of the shoulders are effected in the same way as in the hips—the left shoulder first descends under the pubic arch and there forms the centre on which the right shoulder revolves along the perineum until both emerge, leaving the head only in the pelvis. Whilst all this has been taking place the head has become flexed on the sternum, a position it is important not to disturb by making undue traction on the trunk, lest the neck may become extended and the arms slip up alongside the head, and thus prove a serious bar to delivery. As the shoulders emerge the head enters the right oblique diameter of the pelvis with the occiput towards the left acetabulum; the face then rotates into the hollow of the sacrum, the occiput presses on the pubic arch, and the chin, nose, and forehead sweep along the perineum until the head is born. Now it is evident how important it is that the chin should keep well to the sternum; indeed, sometimes it becomes necessary to assist nature in this respect, to depress the chin by pushing on the malar bones with the two first fingers of the left hand on each

side of the nose (or, as some prefer, in the mouth), and at the same time to make pressure with the two fingers of the right hand against the occiput in an upward direction.

*Second Pelvic Presentation.*—This is the converse of the last, the hips being in the right oblique diameter, with the right trochanter forwards and towards the left acetabulum. The movements are the same as in the first presentation.

*Third Pelvic Presentation.*—The hips occupy the left oblique diameter, with the right trochanter towards the right acetabulum; the right hip presents; the head enters the brim in the right oblique diameter, with the occiput towards the right sacro-iliac synchondrosis, and rotates from right to left. Expulsion is effected as in the first pelvic presentation.

*Fourth Pelvic Presentation.*—The hips occupy the right oblique diameter, with the left trochanter forwards and towards the left acetabulum; the left hip is the presenting part. The head enters the pelvis in the left oblique diameter, with the occiput towards the left sacro-iliac synchondrosis; rotation is effected from left to right, until the face passes into the hollow of the sacrum. Expulsion is effected as in the first pelvic presentation.

With regard to the relative frequency of the various forms of pelvic presentations, the first and second are most common, the third and fourth being of comparatively rare occurrence.

*Foot and Knee Presentations.*—So far as mechanism is concerned, these cases do not differ from breech presentations. It is therefore unnecessary to go again over the same ground.

*Diagnosis.*—In footling cases the membranes usually descend through the os uteri in an elongated form like the finger of a glove, the foot sometimes being

recognisable through them. When the membranes are ruptured the presenting limb should be carefully examined to determine whether it is a foot or a hand. Notice that the ends of the toes form an even line whilst the ends of the fingers are irregular ; the great toe is in close proximity to the rest, whilst the thumb is separate and more mobile ; the projection of the heel beyond the leg is, however, the special diagnostic test. In pelvic and footling cases, when the trunk emerges, the cord, as far as possible must be protected from pressure, by gently pulling it down as

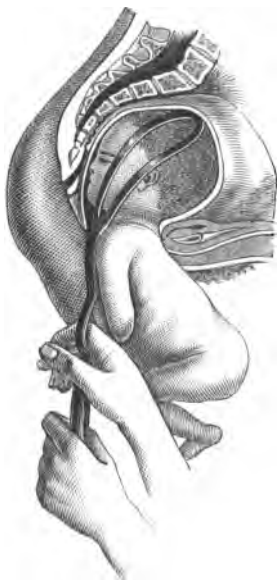


Fig. 66.—APPLICATION OF FORCEPS  
TO THE AFTER-COMING HEAD.

the foetus descends, so as to avoid undue tension, and then endeavouring to guide it into the hollow of one of the sacro-iliac synchondroses. The pulsation of the cord must be observed with the finger, and if any flagging of the circulation is detected, aid must be given at once, or the life of the child will be sacrificed. The plan already described for extracting the head may be tried ; but if there is great resistance, the forceps should be used.

*Transverse Presentations.*

—The foetus is here presented broadside to the os uteri instead of endwise as in the presentations previously considered. In this position, under ordinary circumstances, it is impossible for delivery to take

place without the assistance of art. These presentations are therefore classified as unnatural; shoulder, elbow, and hand presentations are included in this group under the generic title of arm presentation. They are divided into four varieties—two with the child's back towards the abdomen of the mother, and two with the child's back towards the spine of the mother. In any of these cases the child's head may

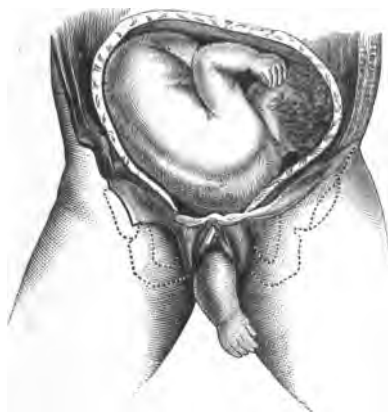


Fig. 67.—ARM PRESENTATION.

lie to the right or to the left; hence the four positions. There is no necessity to speak of the mechanism of this form of presentation, as delivery is usually effected by artificially converting it into a footling case. The early diagnosis of transverse presentations is very important, but not very easy to determine, as the presenting part is generally out of finger reach until labour has advanced in some degree. The shoulder is usually the first part to appear at the os, the arm coming down later on. It may be distinguished from

the breech by being less fleshy, and by having but one projecting part, whereas the breech has two, with the genital organs between. If, however, there is any doubt, the best authorities deem it advisable to gently disengage the limb, when the foot or hand will at once decide the question. If the arm is down, it should be ascertained whether the head or shoulder accompanies it; if the head, it is better not to interfere until it enters the brim, lest bad be made worse by the conversion of a head and arm into a shoulder presentation, pure and simple. After the head has entered the brim, the arm may be pressed up alongside it during the interval between two pains, and kept up during a pain or two, when it will probably be carried up over the brim, and allow the head to present alone. If the shoulder accompanies the arm, the operation of turning should at once be resorted to; for if the foetus and maternal pelvis are both of normal size, unaided delivery is impossible. The shoulder becomes jammed tighter and tighter against the soft parts of the mother, the child dies through the undue pressure, and the mother perishes either from exhaustion consequent on extensive sloughing, or from rupture of the uterus, brought on by violent but futile attempts to expel its contents.

*Spontaneous Evolution and Expulsion.*—Under certain circumstances, however, cases of arm presentation have been delivered by the unaided natural efforts. This may be effected in two ways. First, by the uterus relaxing so far as to allow the arm to recede and the breech to come down, constituting the spontaneous evolution of Denman, a phenomenon of extremely rare occurrence; and second, by the arm remaining down and the neck and shoulders impinging on the pubic arch, forming the centre of motion

for the trunk to revolve on. Expulsion takes place by the trunk becoming gradually doubled on itself, and moving down the hollow of the sacrum to the perineum, delivery being accomplished as in pelvic presentations. This form is of relatively more frequent occurrence than the last, and is described as the spontaneous expulsion of Douglas, who first described it. This obstetrician held it to be the true explanation of Denman's spontaneous evolution ; later observers



Fig. 68.—COMMENCEMENT OF SPONTANEOUS EVOLUTION.

however, have corroborated Denman, and it is now admitted that in both these ways delivery may take place. For Douglas's variety to take place, either the foetus must be considerably under, or the maternal pelvis over, the normal size.

The causes of transverse presentations are ascribed to narrowness of the pelvic brim, spasmodic contraction of the uterus, or undue foetal movement, especially when associated with a large quantity of liquor amnii.



*Funis Presentation* consists in the escape of a loop of the funis below the presenting part of the foetus, and is a complication of the gravest kind with regard to the life of the child. It may accompany any of the numerous forms of foetal presentation, occurring least frequently with cranial, oftener with breech, and most of all with transverse presentations. This disproportion may be accounted for by the difference



Fig. 69.—FURTHER PROGRESS OF SPONTANEOUS EVOLUTION.

in the contour of these parts and the more or less completeness and adaptation of the several foetal presentations to the maternal passages. For example, the head fits the os and other portions of the passage in such a manner as to leave but little room for the cord to get past it; a shoulder presentation, on the contrary, is extremely unfavourable in this respect, the adaptation between the parts being so very imperfect. Close proximity of the placenta to the os uteri is another cause; and sudden rupture of the

membranes, with escape of an excessive quantity of



Fig. 70.—TERMINATION OF SPONTANEOUS EVOLUTION.

liquor amnii, may carry the cord forward and cause the funis to present.

The *Diagnosis* of this complication is not difficult after rupture of the membranes, and before this event it is well not to be too officious in examining, as, by prematurely rupturing them, we may add to the mischief; for so long as the membranes are intact we may safely conclude that the cord is in a position much more favourable than we could possibly give it by manipulation. Moreover, by allowing the membranes to fulfil to the uttermost their office of dilating the passage, we secure the principal conditions of a speedy delivery, so greatly to be desired in funis

presentations. When the cord hangs down in the vagina it may easily be recognised by taking it between the fingers, when, if pressure has not done its fatal work, the foetal pulse will be felt. Even if pul-



Fig. 71.—PRESENTATION OF THE FUNIS WITH THE HEAD IN THE FIRST POSITION.

sation has ceased, it is not difficult to identify the cord by touch alone. It is on record, however, that a coil of the small intestine, passing through a rupture in the uterus, has been mistaken for the umbilical cord; but this blunder could scarcely occur without gross negligence or ignorance, or a perilous union of both. In prolapse of the funis the dangerous effect on the fœtus is the only thing to be taken into consideration, for the progress of delivery is in no way interfered with, nor does the mother encounter any additional

peril. The cause of danger to the child is pressure on the cord, and consequent stoppage of the foetal circulation. To obviate this is no easy matter; for although the funis may possibly be readily replaced, yet it often still more readily comes down again. Various have been the plans for rectifying this aberration. Sir Richard Croft advised that the offending portion of the cord should be carried up to the fundus of the uterus, and there suspended on the limbs of the child, in many cases a difficult and somewhat dangerous proceeding. Some are content with endeavouring to place the prolapsed portion of the cord above the occiput in the hollow of the neck. The difficulties in the way of successfully replacing the cord have led many obstetricians to devise instruments to effect this object. The simplest form, and type of all the others, consists of a thin flat slip of whalebone with an opening near one end, through which a loop of tape is passed; the prolapsed funis being placed within the loop, the tape ends are drawn down so as to bring the funis (without compressing it) close to the instrument, and the whole is then passed up towards the fundus uteri, and either left *in situ*, or after a pain or two the tape is drawn away by liberating one end and pulling at the other, the whalebone being afterwards separately withdrawn. Mr. Robertson uses a large soft and flexible vulcanised rubber catheter with a stilet. A loop of worsted is passed round the cord and through the eye of the instrument, which is introduced with the stilet *in situ*; the stilet is then withdrawn, and the catheter allowed to remain until it is expelled with the placenta. Dr. Barnes suggests that, whilst the cord is being replaced, the patient should assume the *knee-elbow* position. If the cord persists in slipping down again, it is well to try Dr. Collins' plan of

wedging a piece of sponge between the presenting part of the fœtus and that part of the passage where the funis slides down. When, in spite of all efforts,

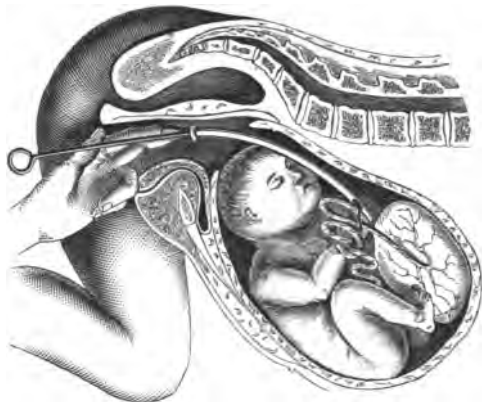


Fig. 72.—MODE OF REPLACING THE FUNIS BY ROBERTON'S INSTRUMENT IN KNEE-ELBOW POSITION. (After Barnes.)

we are unable to return the cord, it should be placed so as to undergo as little pressure as possible; in cranial presentations in the sacro-iliac synchondrosis unoccupied by the head; in other presentations where the fœtus presses least on the pelvis. This condition must be carefully and constantly observed. If pulsation is seriously interfered with, it becomes a question whether delivery should be expedited by artificial means, ergot, version, or the forceps, bearing in mind that in endeavouring to preserve the child's life that of the mother ought not to be endangered. If the child is evidently dead, no steps need be taken unless other circumstances than prolapse of the funis call for interference. We must not conclude however, that the child is dead because

pulsation in the cord has for a time apparently stopped, since life may persist for some time notwithstanding very untoward appearances so far as placental circulation is concerned. If, however, the cord continues flaccid and pulseless, we may safely conclude that the child is dead.

The question of turning is a disputed point, the majority of authorities holding that this operation is rarely called for in funis presentations pure and simple; but if the child is evidently about to succumb and version can be performed without considerably in-



Fig. 73.—MANIPULATION OF FUNIS IN PELVIC PRESENTATION.

creasing the risk to the mother, turning is allowable. Similar evidence must prevail with regard to the advisability of administering ergot, or the application of the forceps.

## CHAPTER IX.

## PLACENTA PRÆVIA.

*Placental Presentation.*—This, which is also frequently called *placenta prævia*, consists in the attachment of the whole, or part of the placenta, over that portion of the lower segment of the uterus which is subject to dilatation during labour. When the placenta is implanted completely over the internal os, it is said to be *placenta centralis*; when only partially, *placenta lateralis*.

The usual position of the placenta is to the right or left of the fundus, generally to the right. The causes of abnormal attachment are not satisfactorily established.

The ovule, generally supposed to be impregnated prior to its arrival in the uterus, usually selects a spot on which to attach itself adjacent to the opening of the Fallopian tube. Leishman supposes that the tumid and rugose condition of the uterine mucous membrane existing during menstruation and for a short time afterwards mechanically arrests the ovum, which would otherwise gravitate towards the cervix; so that if through any delay the ovum makes its appearance after this turgid condition of the mucous membrane has subsided, it may descend and be arrested lower down; or, which probably happens more frequently, it may escape altogether. If the ovum attaches itself to the lower segment of the

uterus, placental presentation must result. Tyler Smith opines that even if the ovule escapes from the Fallopian tube in an unimpregnated condition, it may become attached to the cervical region and there undergo impregnation. In the earlier months of pregnancy there is nothing to indicate the existence



Fig. 74.—ENTIRE PLACENTA PRÆVIA.

of placenta prævia, though, at this period, the fact of the attachment of the placenta to that portion of the uterus immediately above the cervix, may cause uterine irritation, followed by abortion. In the latter months, placental presentation usually gives rise to more or less severe attacks of hæmorrhage, and their recurrence should warn the attendant to be on the alert to take the necessary precautions. When



summoned to such an attack of flooding, it is imperative to make an examination, so that if the placenta does present, the patient may be treated in accordance with the gravity of the case. Examination, perhaps, reveals to the finger a thick and turgid condition of the os, owing to the increase in size of the vessels, which have become enlarged for the purpose of supplying the placenta. If the os is partially dilated, the soft mass of the placenta, differing in its fibrous texture from a clot, may be felt; this is much easier to make out if the head presents, as it affords a background, so to speak, on which the examination can be made. In other presentations the result is frequently less satisfactory. The placental bruit will be heard most distinctly in one of the iliac regions. Dr. John Wallace recommends vaginal stethoscopy as an aid in diagnosis. The distinction between hæmorrhage from placenta prævia (or unavoidable hæmorrhage) and that which arises from detachment of the placenta when it occupies its normal position (accidental hæmorrhage), is that in placenta prævia the hæmorrhage increases during a pain, from further detachment of the placenta, whilst in accidental hæmorrhage, the presenting part, acting like a ball valve, blocks up the os uteri during each pain, and thus stops the egress of blood, which, in this form of bleeding, is poured out higher up in the uterus. The loss of blood in placental cases varies from a few insignificant spurts to a sudden and alarming outpouring, sometimes even destroying the patient ere assistance can be procured. The bleeding often takes place prior to the commencement of labour, and results from accidental detachment of small portions of the placenta, each detachment causing a more or less severe attack of hæmorrhage. It is when the lower uterine zone begins to dilate after the commencement of labour

that hæmorrhage in the most violent and alarming forms comes on. This, like accidental hæmorrhage, may be repeated several times during labour, as successive portions of the placenta are detached. In such cases it behoves the attendant to be ready to act with promptitude, for in the whole range of midwifery none require more self-possession. The principal methods of treatment are the plug or tampon, puncturing the membranes, version, and extraction or separation of the placenta. When hæmorrhage occurs after the latter half of the seventh month of utero-gestation, and is ascertained to be due to placenta prævia, Dr. Greenhalgh recommends the induction of premature labour at once, or as soon as the condition of the patient will permit. To this end he advises that an air-ball covered with spongopiline should be introduced into the vagina and then inflated, while a bandage is firmly bound round the abdomen, and ergot and borax administered in repeated doses. If, in the later months of pregnancy, an attack of flooding followed by a continued drain sets in, the plug is the fitting initiative treatment, though it must be remembered that plugging is but a temporary resource till more efficient measures can be taken.

Various materials are made use of to form the plug. If we want it to remain in the vagina only a short time, a piece of sponge is the best substance, for when placed *in situ* its tendency to swell from absorption of the blood makes it more effective. The objection to sponge, however, and indeed to almost any other substance except the elastic bag, presently to be described, is that the uterine discharge soon renders the plug fœtid, so that it requires to be changed frequently, say every two or three hours. Strips of lint dipped in iced water and passed, with

the aid of a speculum, one by one up the vagina until it is filled, form a very efficient plug [*vide* the method of plugging given in the section on Abortion]; or we may use a hollow ball, made of caoutchouc, introduced empty and then inflated either with air, or filled with iced water by means of a tube attached to the ball. It is well to empty the bladder previous to plugging. The object of plugging is to compress the placenta between the presenting part of the foetus and the substance introduced, and thus to check hæmorrhage and at the same time to favour coagulation of the blood already effused. The patient should be fed with simple diet, and kept perfectly quiet in a cool and airy room, lying on a hard bed, with the pelvis slightly raised. Internal remedies in the form of astringents are useless.

*Puncturing the Membranes*, strongly recommended by Dr. Barnes, can be resorted to when the os is too small to admit of any other procedure save plugging. The operation is performed either by the finger, or, if the os will not admit the finger, by a probe or trochar, that side of the os being selected which is free from placenta. Its advantages are that the evacuation of the liquor amnii reduces the size of the uterus, diminishes its blood supply, and facilitates the induction of labour where turning is impossible; and the presenting part of the child pressing against the cervix uteri acts as a plug to restrain the hæmorrhage. On the other hand, puncturing the membranes renders turning far more difficult, and puts the child's life in greater peril. Moreover, evacuation of the liquor amnii does not always promptly induce labour, nor arrest hæmorrhage, flooding not unfrequently taking place when there is no liquor amnii.

Version is the accepted treatment in the great majority of placental presentations. When the os

uteri is dilated, or dilatable, and the patient not greatly exhausted by excessive flooding, version gives the greatest chance of life to the child and of recovery to the mother. The operation should be performed as soon as the os is sufficiently dilatable, the risk to both mother and child being increased with each successive hæmorrhagic attack. If the os is closed, or dilates slowly, artificial dilatation must be resorted to.

The hand is passed into the os uteri in the usual way, choosing that side of it least covered by the placenta, and the feet are searched for and brought down. Version, as a rule, is easier in cases of placenta prævia than in ordinary cases of mal-presentation, as the uterus is rendered passive and dilatable from loss of blood. The hand and afterwards the arm plug the os, until the child's legs in coming down fulfil the same office in a still more efficient manner.

Cases have occurred where the excessive violence of the uterine contractions has driven all before them, detaching the placenta, and forcing it along the vagina with the child behind it. This example has been imitated, in some degree, by detaching the placenta artificially in the expectation that the hæmorrhage would cease, and the necessity of turning be thus avoided. Mr. Kinder Wood and Dr. Radford of Manchester were the first to adopt this treatment, and subsequently Sir James Simpson advocated it in his usual vigorous manner. Sir James collected statistics on the subject which put the proposed plan in a very favourable light with regard to both mother and child, the mortality of children in cases of placenta prævia being notoriously great. Unfortunately the value of these statistics was lessened by including under the same head both cases of natural expulsion and artificial extraction. That natural expulsion is favourable to the life of the child may be readily conceived,

inasmuch as the excessive energy of the uterine contractions, after detaching the placenta, quickly urges the child into the world; but in cases of artificial extraction, we have no security that uterine action will follow with such rapidity as to save the child from death through loss of blood.

In twenty-five of the cases out of eighty-six adduced by Simpson, extraction of the placenta had to be followed by version, thus placing the operation on a very different footing to natural expulsion. Sir James Simpson also held that in placenta prævia the source of hæmorrhage is the placental cells on the surface of the detached portion of the placenta, the blood being supplied through the uterine vessels to that portion of the placenta still attached, a view strongly controverted by Drs. Robert Lee, Tyler Smith, Mackenzie, and others, and which has been proved experimentally to be incorrect.

Dr. Tyler Smith argued that although there is no impediment to the flow of blood through the placental cells and openings on the placental surface, still if only half the placenta were detached sufficient blood could not be poured out to account for the immense gushes which are so often witnessed; and further, that the size and valveless state of the uterine veins, the channel being unimpeded from the right auricle to their open mouths, are strong evidences in favour of the supposition that the principal part of the blood in cases of placenta prævia comes from the veins, at the same time allowing that some bleeding does occur from the detached surface of the placenta. Whilst differing from Sir James Simpson as to the source of the hæmorrhage, Tyler Smith agrees with him that entire detachment of the placenta arrests flooding, and explains that "the separation of the placenta furnishes a source of irritation which excites the uterus generally,

and the muscular structure at the site of the placenta especially, to contraction, and that in this way hæmorrhage was prevented."

Dr. Radford limits the cases suitable for this operation to three classes: 1st, when the woman is so far exhausted as to render turning hazardous; 2d, in distortion or tumour of the pelvis; and 3d, when the child is dead. The death-rate in cases of placenta prævia, treated in the ordinary way, is, in the mothers about 1 in 3, and in children about 65 per cent. Sir James Simpson gives as the result of extraction (including natural expulsion), 1 in 11 of the mothers, and 69 per cent in children. Dr. Radford gives 1 in 11 mothers, and 1 in 8 children, as the result of his experience in extraction cases. Of the last-named gentleman's fifty-five cases, eighteen only were terminated by the unaided efforts of nature, twenty-eight were turned, and in the rest the forceps, perforator, etc., were employed. Dr. Barnes, who has devoted much attention to the causes and treatment of placenta prævia, divides the uterus into three zones—fundal, meridional, and cervical, the cervical being the unsafe placental region. He includes in the cervical zone all that portion of the uterus which retracts to give passage to the fœtus, and fixes its limits at a distance of about three inches from the os internum, maintaining that hæmorrhage ceases if the placenta is detached from the cervix for this distance. To perform this operation one or two fingers are passed as far as they will go through the os between the placenta and the uterine wall, then swept, as far as they will reach, round the uterus so as to separate the placenta and also to rupture the membranes, if possible, when "commonly some retraction of the cervix takes place, and often the hæmorrhage ceases." The arrest of the hæmorrhage is attributed by Dr. Barnes to active con-

traction of the muscular structure of the uterus closing the mouths of the vessels. It will be seen that there is a wide difference between Simpson's method of total detachment and extraction of the placenta and Barnes' detachment of the cervical zone only, Simpson's being a formidable and difficult operation, Barnes' plan, though equally efficacious, being comparatively easy of performance. Objection has been raised to Barnes' theory on the ground that the cervical portion of the uterus is sparingly supplied with muscular tissue, which undergoes but slight development in the gravid state as compared with that of the body of the organ, and therefore that the stoppage of the hæmorrhage is due to general contraction of the uterus induced by irritation set up from detachment of the placenta forcing the presenting part of the foetus against the cervix, and causing it to act as an internal tampon. In answer to these objections, Dr. Barnes states that the cervical zone does not consist of the cervix proper, but of the lower zone of the body of the uterus immediately above the cervix, which is not deficient in muscular tissue.

In cases of placenta lateralis, Dr. Cohen of Hamburg detaches the placenta from that side of the cervix on which the least bulk of it is implanted, a proceeding which he states is sufficient to arrest hæmorrhage and afford a passage for the foetus.

The balance of opinion so far tends to limit the operation of extraction and separation to cases where the exhaustion of the mother is too great to admit of turning, and to those in which the child is dead.

## CHAPTER X.

## SIGNS OF PREGNANCY.

THE early diagnosis of the gravid state is a matter of great importance, and, moreover, is a point upon which the practitioner is frequently called to investigate and pronounce judgment. Previous to the fourth month the signs are insufficient to enable us to give an absolute opinion one way or the other, although the combination of symptoms may lead to an inference little short of certainty. A very obvious symptom of pregnancy is suppression of the catamenia. Although this may take place independently of pregnancy, still it is one of the most regular and constant signs, and serves as an indicator to the mother to foretell the date of her delivery. The catamenia are usually absent during the whole period of utero-gestation, though exceptional cases occur where menstruation goes on throughout the gravid state. In many of these instances, however, it is probable that the discharge proceeds from some abrasion of the os or cervix uteri. At an early period after conception the uterus is the seat of a series of changes pertaining to the gravid state; it becomes more vascular, and the os assumes a tumid pulpy condition appreciable to the touch. The digestive organs speedily sympathise with the new condition, "morning sickness" being a frequent and well-marked symptom of pregnancy. In some women it sets in immediately after conception, in others



not for two or three weeks, and it usually subsides about the fourth month. Perversion of appetite, ptyalism, and persistent cough, the result of reflex action, are sometimes met with. A sensation of fullness, with shooting pains, soon shows that the breasts participate in the excitation of the uterine apparatus. About the second month these glands become nodulated to the touch, and display tortuous veins under the skin ; soon after this period a small quantity of viscid fluid with the microscopic characteristics of milk may frequently be squeezed out of the nipples ; and although this secretion may arise from other causes than pregnancy, still it is a valuable sign, though the mammary enlargement itself may possibly be caused by a uterine tumour. The changes which take place in the nipples and areolæ are important indications ; the nipples become turgid, the areolæ deepen in colour from deposition of pigmentary matter, the glandular follicles enlarge and become prominent, the change in colour varying according to the woman's complexion, being darker in proportion as she approximates to the brunette. In some pregnant women there is a deposit of pigmentary matter under the skin of the abdomen, usually in the median line from the pubes upwards, which imparts a brownish hue to the integument ; a similar pigmentary coloration may manifest itself on the face, especially the forehead ; such marks often persist for some time after parturition.

The cardinal physical sign is enlargement of the abdomen consequent upon increase in size of the developing uterus. This enlargement begins to be manifest about the third month, when the fundus uteri is just perceptible above the pubes ; about the fifth month it reaches midway between the pubes and umbilicus ; at the sixth month it is level with the

umbilicus, and continues to ascend until at the ninth month it extends as far as the ensiform cartilage, sinking somewhat into the pelvis. Coincident with this enlargement of the uterus, changes in its angle

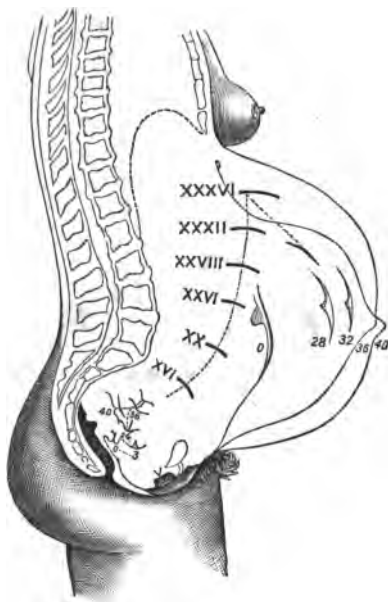


Fig. 75.—DIAGRAMMATIC REPRESENTATION OF THE CHANGES IN POSITION OF THE UTERUS DURING GESTATION.

The numerals indicate in weeks the height of the Fundus Uteri. The italic figures indicate respectively, also in weeks, the Abdominal Enlargement and Positions of Cervix Uteri. (After Schultze.)

of inclination take place. The first alteration occurs prior to any perceptible enlargement, and is produced by increase in weight, which causes the organ to sink in the pelvis with its cervix towards the sacrum and

its fundus anteverted, so as frequently to press on the bladder, giving rise to the irritability of that organ so common in the early period of pregnancy.

As the uterus rises out of the pelvis it gradually assumes a direction coincident with that of the axis of the pelvic inlet, and consequently the cervix points towards the promontory of the sacrum; at a still more advanced stage the uterus occupies the cavity of the pelvis, and the presenting part of the fœtus can be felt per vaginam through the anterior uterine wall.

Abdominal enlargement may proceed from a variety of causes independent of uterine development, as dropsy (ovarian and ascitic), flatus, deposition of fat, etc.

Dr. Braxton Hicks, in a paper in the *Obstetrical Transactions*, vol. xiii., calls attention, as a means of diagnosis, to an alternate state of contraction and relaxation of the uterine walls after the end of the third month of pregnancy. This condition may be felt by placing the hand in firm contact with the abdominal walls over the uterus for a period of from five to ten minutes. If at the moment of contact the organ is in a state of contraction, it will be found to be firm and solid, which condition it retains from two to five minutes, to be succeeded by a period of relaxation, when the uterine walls become so soft and flaccid that their outline can with difficulty be made out. The contractions recur at intervals varying from two or three minutes to half-an-hour, occurring in most cases every five or ten minutes. Dr. Hicks explains that these contractions are the cause of the alternate rise and fall in the pitch of the so-called placental bruit; for, during a contraction, the uterine sinuses are diminished in calibre, and the rapidity of the blood-flow consequently increased, and the sound thereby exalted in pitch.

Whilst the body of the uterus has been developing in size, the cervix has been undergoing certain changes. During the early months it projects into the vagina



Fig. 76.—OS AND CERVIX UTERI  
AT THE THIRD MONTH OF GES-  
TATION.



Fig. 77.—AT THE SIXTH MONTH.



Fig 78.—AT THE EIGHTH MONTH.



Fig. 79.—AT THE FULL TERM.

as in the unimpregnated condition ; but about the fifth month this projection becomes less apparent and at the full period of pregnancy the cervix is entirely obliterated and cannot be distinguished by digital examination. The explanation of this altera-

tion of the cervix will be found in the section on the Gravid Uterus. In primiparæ the os uteri is firm, and remains closed to the end of pregnancy, but in multiparæ the orifice is sufficiently patent to admit the tip of the finger. When the fourth month is reached, the mother usually experiences a movement on the part of the child, which has been called "quickening." If this, however, be taken to imply that now for the first time the foetus is endowed with life, the term is fallacious; it may simply be taken to mean the first perception on the part of the mother of her infant's vitality. This sign varies considerably in degree; with some it is a constant and trustworthy guide in every pregnancy, the movement of the foetus being accompanied by more or less constitutional disturbance, as sickness and a sensation of faintness; with others quickening is barely noticeable; whilst others again are not cognisant of it at all. This symptom may be sought for either by palpation or by auscultation. The foetal movements may often be felt by laying one hand flat on the maternal abdomen, and gently percussing with the other, so as to disturb the foetus, and cause it to respond by movement. The stethoscope may also be used, in either case care being taken to discriminate between the foetal impulses and those produced by contractions of the uterine or abdominal muscles of the mother.

The most definite and indeed the only certain sign of pregnancy, is the sound of the foetal heart, usually not to be distinguished before the eighteenth week; but, when once heard, it establishes beyond all doubt the presence of a living foetus. The foetal pulsations are very rapid (from 120 to 150 in a minute), and nearly resemble the ticking of a watch placed at a short distance from the ear. Nothing can interfere with

the diagnostic value of this sign except the sound of the maternal circulation, and the two sounds may be readily discriminated by placing the finger on the radial artery of the mother whilst listening to the beat of the foetal heart, when the absence of synchronism at once identifies the origin of the auscultatory sound. The area of the foetal heart sounds over the maternal abdomen is limited in extent, and obviously varies with the position of the foetus. The sounds are most distinctly heard when the dorsum of the child is towards the mother's abdomen; when the child faces the mother's abdomen, the thicker layer of liquor amnii and the child's limbs interfere with the conduction of the sound of the foetal pulsations. In the majority of cases the foetus lies with its back towards the mother's left side, therefore the heart sounds are most plainly heard at a point midway between the umbilicus and the left anterior superior spine of the ilium; next in frequency is the corresponding spot on the right side. In breech cases the sound area is higher up, above the umbilicus.

If after the lapse of the normal interval after conception the foetal pulse is not heard, it does not follow that no foetus is present; for the foetus may be dead, or its heart-beats may be so feeble that they are indistinguishable through the uterine walls. Excess of liquor amnii, of fat on, or of flatus within the maternal abdomen may render the heart sound even of an ordinary vigorous foetus inaudible; in such cases repeated examinations are necessary to establish a diagnosis. Another auscultatory sign, which may be heard a week or two before the foetal heart, is the uterine souffle, caused by passage of the blood through the enlarged uterine vessels, and usually more distinctly heard over that part of the uterus giving attachment to the placenta, although the sound is

not restricted to the placental site as was formerly taught. The sound is that of a blowing murmur, synchronous with the maternal circulation. In diagnostic value it is inferior to the sound of the foetal heart, though still a valuable sign of pregnancy, but not of foetal life. It must be borne in mind, however, that a very similar sound may be produced by aneurism and uterine tumours.

*Ballottement.*—The successful performance of this manœuvre goes to prove the presence of a foreign body in the uterus. Whilst the patient is in the erect position, or recumbent with her shoulders raised, one or two fingers of the right hand are introduced into the vagina, the point of one finger is passed to the cervix uteri, and a sudden impulse made in an upward direction, when the foetus, after being driven towards the fundus, drops again on the tip of the finger, to which it communicates the sensation of a free-falling body. *Ballottement* is most successful from the fourth to the seventh month, as the cavity of the uterus is then large in proportion to the size of the foetus. It is not an infallible sign of pregnancy, as a similar sensation may be produced by a stone in the bladder, or by the fundus of an anteverted uterus. It is likewise of little avail if the placenta covers the os, or in footling cases.

Amongst the minor signs of pregnancy may be enumerated the presence of *kiestein* in the urine in the form of a pellicle on its surface when it has been allowed to stand a day or two. Unfortunately, however, *kiestein* occurs sometimes in the urine of non-pregnant patients, and is therefore of little practical value. A dusky hue of the vaginal mucous membrane, and pulsation of the vaginal artery, are spoken of as indications of the gravid state; but these conditions may also proceed from other causes,

and are therefore by themselves not to be relied upon, although they may be received as supplementary evidence.

*Duration of Pregnancy.*—This subject has received much attention from obstetricians, not only in a physiological point of view, but in respect to its important legal bearings.

Numberless difficulties encounter the attempt to date the exact period of the occurrence of parturition; the data employed to determine this question are:— (1) Cases of impregnation resulting from a single coitus; (2) Cessation of the menses; and (3) Date of quickening. The result deducible from a single coitus is liable to a certain degree of error arising from the uncertainty as to the time interposing between insemination and impregnation. Under favourable circumstances the spermatie filaments may retain their fecundating power for some days after emission, when, if the ovule be delayed in its escape from the ovary for an equal period, actual contact, and consequently fertilisation, is postponed for a more or less extended interval; on the other hand, if the ovule has reached the uterus at the time of coitus, it may be fertilised forthwith. The stoppage of menstruation is by no means a certain indicator whence to deduce the exact period of impregnation, for this may take place immediately after the last discharge, or at some period nearer the time when the next menses is due. We have no evidence as to how long the spermatozoa and ovule (after its escape from the Graafian follicle) will retain their vitality within the female generative organs. The examination of the uteri and ovaria of animals several days after coitus, shows the spermatozoa in their usual active condition. With regard to the ovule we are still further from any precise knowledge of its viability.



Quickening is still more misleading, as it is a symptom dependent for recognition upon the perception of the mother, which we know varies to such an extent as to deprive her evidence in this question of any scientific value.

The only way to solve the difficulty is to take the evidence of carefully collated statistics; these give the period of 40 weeks or 280 days as the duration of normal gestation; it will be observed that we have here a multiple of the menstrual interval, which has led some writers to credit the ovaries with the power of initiating parturition.

Two important questions now arise. The first is—To what extent, compatible with bringing forth a living child, may these 280 days be augmented? Cases are recorded where the term of gestation exceeded 313 days; others in which even this liberal allowance has been exceeded to such an extent as to pass the limits of credulity. That the normal period may be exceeded by one or two weeks is undoubtedly a fact, but it is impossible to fix the precise maximum time the living foetus may remain in utero.

The converse question is of equal and more practical interest—How short a time after conception may a viable child be brought forth? This problem, for obvious reasons, is not liable to such exaggerated statements as the last; still no definite answer can be given. An instance of early viability is given by Murphy, the length of gestation being 175 days, and the same author gives 171 days as the shortest period.

In calculating the probable date of delivery in ordinary practice, we reckon 280 days from the last catamenial period. The German method of calculation is convenient: given the date of the last menstrual period, go back three months, and then add

seven days ; thus, let March 1st represent the last menstrual period, three months back equals December 1st ; add seven days and you get December 8th, the approximate time of delivery.

## CHAPTER XI.

## DISEASES OF PREGNANCY.

WOMEN are liable to a variety of diseases incidental to the gravid state, some affecting the whole system, others attacking only the generative organs. Thus the diseases of pregnancy may be divided into—1st, general; and 2d, localised affections. One of the most common of the general complaints in the latter months of pregnancy is anasarca, few women escaping without experiencing at least a trace of it in the shape of swollen feet. The symptoms may range from simple puffiness of the ankles to œdema of the whole body, with the legs enormously increased in bulk, and the labia distended to the size of a child's head, causing, as may be imagined, in this exaggerated form, much pain and distress. This condition, formerly attributed solely to pressure of the enlarged uterus on the pelvic vessels, is now known to be connected, usually at least in the severe forms, with the presence of a certain amount of albumen in the urine, indicating congestion of the kidneys. The presence of albumen arises from pressure delaying the return of the blood from these organs, it having been proved experimentally on animals that ligature of the renal veins will induce albuminuria. Albumen in the urine of pregnant women is a matter of much importance, since its presence indicates great liability to convulsions during parturition; it is therefore well to

examine the urine in all suspected cases. In anasarca resulting from pressure on the veins which return the blood from the lower extremities, the cedema is confined principally to the legs; but when the whole body is swollen, it is probable that the kidneys are affected. It is obvious that the anasarca cannot be cured until the exciting cause is removed, but much relief may be obtained by warm or vapour baths, dry-cupping the loins, diuretics, as acetate of potash, decoction of broom, or a combination of digitalis and acetate of iron. If the legs chiefly suffer, it is well to maintain, as far as practicable, the recumbent or right-angled position.

Diabetes may occur during pregnancy, may come on after labour, or conception may take place during an attack of diabetes. Pregnancy may go on favourably to the full term in a diabetic patient, or abortion, miscarriage, or premature labour may occur. Dr. Matthews Duncan observes that when this disease interrupts the course of pregnancy the child almost always dies. During lactation a certain amount of sugar may be present in the urine, and is then regarded as a physiological condition.

Headache of a severe and intractable type, somnolence, dizziness, singing in the ears, or some abnormality of the organs of vision, are frequently caused by the presence of urea in the blood as a consequence of renal mischief; various forms of paralysis are also liable to be produced by uræmic poisoning. In such cases the treatment should be directed to the kidneys. Symptoms, in many respects analogous to the above, may result from simple hyperæmia, unattended with renal mischief, a condition demanding the use of saline aperients and a free vegetable diet, especially fruits, with a proportional diminution of animal food.

The persistent symptomatic sickness of early preg-

nancy may become a very severe and troublesome complication, reducing the patient to a state not far short of starvation. In the worst cases, all food, solid or liquid, is immediately rejected, the epigastrium becomes tender, and the violent retching and vomiting may rupture a blood-vessel in the stomach. Dr. Copeman relates in the *British Medical Journal*, May 15, 1875, three cases of obstinate vomiting during pregnancy, which were relieved by artificially dilating the os uteri with the finger. Dr. Graily Hewitt suggests that the vomiting of pregnancy is frequently caused by flexion of the uterus, the nerve filaments being compressed at the seat of flexion, and further suggests that in Dr. Copeman's cases vomiting proceeded from this cause, and that the relief afforded was due to removal of the pressure by the process of dilatation resorted to. The treatment consists in abstinence from solid food, and in endeavouring to allay the irritability of the stomach by means of iced drinks, soda-water, or lime-water and milk, champagne, etc., and the administration of hydrocyanic acid, bismuth, oxalate of cerium, kreasote, pepsine, etc., and the external application of sinapisms or belladonna plasters, or of ice bags to the spine. Vaginal pessaries of morphia and atropine are often useful, and in very obstinate cases I have seen much benefit result from the free application of nitrate of silver to the os and cervix. I have also witnessed the singularly beneficial effect of single-drop doses of ipecacuanha wine (the first drop to be taken in the morning before raising the head from the pillow), given four or five times a day as recommended by Dr. Ringer. A foul tongue and loaded bowels call for mild purgatives as Pil. Rhei Co. Peptonised food, being easy of assimilation, is sometimes retained when ordinary food is not. In extreme cases when

the stomach rejects everything, nutrient enemas, with or without pepsine, may be tried ; but if the patient seems likely to sink, abortion should be effected without delay.

A pregnant woman is sometimes troubled with dyspepsia, loss and vitiation of the appetite, heart-burn, etc. If, in the matter of diet, the whims of the patient are not injuriously extravagant, they may, within reasonable limits, be indulged. The dyspeptic symptoms may be treated in the ordinary way.

Ptyalism, though a somewhat unfrequent trouble during pregnancy, occasionally occurs in a distressing degree. Ptyalism often commences at the earliest stage of pregnancy, and some women become cognisant of their condition through the occurrence of this symptom. As a rule, there is no constitutional disturbance, no ulceration of the gums or mucous membrane of the mouth, nor any foetid odour of the breath. The fluid, which is thin and tenacious, may vary from a slight increase of the normal quantity to two or three quarts in the twenty-four hours. Treatment is of little avail ; gargles of alum, chlorate of potash, sulphite of soda or borax sometimes restrain the flow ; and quinine, nitro-hydrochloric acid with chlorate of potash will support the general health. Ptyalism is caused by an altered state of the nervous supply to the salivary glands. It ceases with the birth of the child.

Inactivity of the bowels is a common, almost constant, condition during pregnancy. The enlarged womb pressing on the bowel greatly interferes with its peristaltic action, and induces a condition of alvine atony even in women who, at other times, have regular and healthy evacuations. Dietetic treatment should first be tried, as ripe fruit, oatmeal porridge, bran bread, etc., although it is not at all easy to

induce a pregnant woman to adhere to a systematic course of diet. Amongst the medicinal remedies may be enumerated the time-honoured castor-oil, which, however, should not be insisted upon, as it is extremely repulsive to many patients. The mineral waters of Carlsbad and Friedrichshall, when taken first thing in the morning, are very efficacious. The liquid extract of *Rhamnus frangula* is a very agreeable aperient. Should the rectum, through neglect, become blocked with hardened fæces, enemata are necessary.

Diarrhoea and dysentery are troublesome and debilitating incidents in pregnancy. Before giving astringents it is well to ascertain that the bowels are not loaded with hard fæcal matter, a condition by no means unfrequent during diarrhoea, and requiring enemata and castor-oil. Neuralgia of the face and mammae may be generally relieved by quinine, or croton chloral hydrate, and the application of anodyne liniments. In some cases the uterus is the seat of severe neurosis. I saw a distressing case of this kind with my friend Dr. Gardiner of Ashton, which resisted all treatment, and was so intense as to require the induction of premature labour.

The blood of healthy pregnant women, especially towards the end of gestation, is deficient in discs and albumen, whilst the fibrin is present in increased quantity; now, should this temporary condition become excessive, anæmia will result, which may be treated pretty much as in the non-gravid state. This condition of the blood may develop into progressive pernicious anæmia. The disease sets in towards the mid-period of pregnancy, and is more apt to befall women pregnant late in life. It is marked by extreme debility, feverishness, anorexia, vomiting, dyspnœa, and a runaway heart. A drop of blood

examined microscopically is characterised by ill-shapen red corpuscles and granular matter. Treatment seems of little avail, the tendency being to slow and progressive dissolution. In severe cases it may be necessary to induce premature labour. Transfusion has been fruitlessly tried.

Another troublesome disorder during pregnancy is the cough due to reflex causes. It often lasts during the whole term of utero-gestation, and treatment beyond relieving the distress produced by it is of little use. Labour is the only cure.

Pregnancy exercises an injurious effect in certain chronic ailments, such as cardiac and renal disease, and also, contrary to popular supposition, upon phthisis. Acute diseases, as the exanthemata and continued fevers, if in a mild form, run the usual course; if severe, they usually induce abortion. Acute pulmonary complaints, especially pneumonia, are more fatal than in the unimpregnated condition.

During the later months of pregnancy varicose veins in the legs are very common, and require the recumbent position, elastic stockings, and bandages. Hæmorrhoids draw attention to the condition of the bowels; as external applications, hot fomentations and Ung. Gallæ Co. are useful. Sometimes we find a varicose condition of the vaginal and labial veins; if the pressure be very great, the veins may burst subcutaneously and form a thrombus, which may attain to considerable dimensions. In some cases the effused blood is removed by absorption, in others an opening has to be made to evacuate the blood and clot.

In affections of the bladder, as irritability, inducing a constant desire to pass water, and incontinence or retention of urine, the position of the womb should be ascertained; displacement of that organ not un-



frequently being the cause of such ailments. In some instances the origin is purely sympathetic, as in the vesical irritation so frequently met with in the earlier months of pregnancy. When the position of the womb is in fault, attempts must be made to rectify the displacement by manipulation and the application of bandages, and by rest in the recumbent position. If the cause is sympathetic, small doses of morphia or belladonna, or the introduction into the vagina of medicated pessaries containing morphia, will afford relief.

Pressure of the gravid uterus on the liver, diaphragm, sacral nerves, etc., induces a variety of painful symptoms, which can be palliated by narcotics, friction, rest, etc. Jaundice, especially when due to hepatitis (acute yellow atrophy), is occasionally a serious complication, the cholæmia often proving fatal to the foetus. Very troublesome and irritating pruritis of the vulva sometimes occurs in the early months of pregnancy. In very severe cases it spreads to various parts of the body, and the irritation now and then becomes so wearing as to cause abortion. Small vesicles are found on the inner surface of the labia, which are due to acidity of the vaginal discharges and want of cleanliness. The treatment consists in frequent ablution with bran water, and the use of borax lotion with opium, an ointment of equal parts of red oxide of mercury ointment and cod-liver oil, or chlorate of potash with glycerine and hydrocyanic acid.

During gestation the central nervous system, as might be expected, is, in many cases, more or less disturbed. Motor and sensory affections of various parts of the organism are not unfrequently met with: as hemiplegia, paraplegia, local paralyses, partial or complete paralysis of the nerves of special sense, for-

mication, local (vulvar) or general; trophic derangements, giving rise to vesicular and other affections of the skin. Many of these disorders are associated with albuminuria, and disappear after delivery; if in such cases the symptoms are severe it may be necessary to induce premature labour. The condition of the blood in pregnancy conduces to the formation of fibrinous vegetations, which may give rise to embolism in some part of the nervous centres. Chorea is a rare but serious complication, often producing abortion; the bromides of sodium, potassium, and ammonium afford the best chance of relief, but if the attack is so severe as to exhaust the patient through loss of sleep, the induction of premature labour is the only resource. Direct pressure of the uterus on the lower spinal nerves not unfrequently produces paresis of one leg, generally the left; as in all the less severe forms of peripheral paralyses, the tendency here is to recovery after the pressure is removed. Paralysis of the lower extremities sometimes follows severe and prolonged instrumental labours, from injury to one of the cords of the lumbar or sacral plexus; the duration of the paralysis obviously depends upon the amount of bruising sustained by the nerves.

Amaurosis may occur during pregnancy without albuminuria and without ophthalmoscopic evidence of extravasation of blood into the retina. Dr. Eastlake has recorded a remarkable case in which amaurosis occurred after parturition in eight successive pregnancies. He saw the case after the eighth labour. In this case there was no albumen in the urine, and an ophthalmoscopic examination made by Mr. Zachariah Laurence revealed only slight contraction of the retinal arteries. Vision invariably returns after labour. Treatment during pregnancy is of no avail. If the symptoms are very grave it may be necessary, as in

a case recorded by Dr. Churchill, to induce premature labour.

Copious leucorrhœa is of common occurrence in pregnancy, resulting from a hyperæmic condition of the vaginal mucous membrane and glands; the discharge is usually of a purulent character, and often produces severe excoriation of the vulva and neighbouring parts. Cleanliness is the great preventive of evils resulting from this cause. Vaginal injections, if deemed necessary, should be of a mild nature, and should be cautiously used, a few drops of a solution of permanganate of potash in a pint of water being generally all that is needed. It should be remembered that the use of vaginal injections during uterogestation is not unattended with the risk of inducing premature labour. If more powerful remedies are necessary, we may advantageously resort to medicated vaginal pessaries containing tannin, or alum.

*Displacements of the Uterus.*—The various forms of uterine displacement met with in the non-gravid state are liable to assume aggravated proportions in the developed organ; in some cases a normally-placed uterus becomes displaced for the first time, through accident or other causes, after the commencement of pregnancy.

*Prolapse of the Uterus.*—The predisposing causes of this displacement are a relaxed condition of the uterine ligaments, and a more than ordinarily capacious pelvis; the uterus then sinks down to and rests on the perineum, where it may be felt through the vagina to be more or less protuberant. The symptoms are a feeling of pressure on the rectum and bladder, with a bearing-down sensation. The regular evacuation of the bladder and rectum, and the observance of the recumbent position for a time, will effect a cure as the uterus develops and rises out of the pelvis.

*Anteversion of the Uterus*, to a certain extent, is a displacement which frequently takes place during the early stage of pregnancy, causing vesical irritability which soon subsides with rest; in some cases, however, the malposition exists later on and requires special means to be taken for its reduction. On vaginal examination, the os uteri will be found high up in the direction of the sacrum, and the fundus pressing on the bladder will be felt through the anterior vaginal wall. Reduction should be attempted by pressing with the fingers on the anterior wall of the vagina, and so pushing the fundus upwards; repeated replacement, opiates, and rest in the dorsal position should be resorted to, together with the application of a bandage to assist in keeping the uterus in position.

*Retroversion of the Uterus*.—This malposition is the converse of the last, and usually occurs previous to the fourth month of pregnancy. The displacement may be either partial, constituting *retroflexion*, or it may exist as complete *retroversion*. In retroversion the os uteri is tilted up towards the umbilicus, the base of the bladder and urethra being dragged up with it, displacing the meatus urinarius to such an extent as to render the passage of the catheter a very difficult procedure. The finger passed into the vagina takes a forward direction immediately behind the symphysis pubis, instead of towards the sacral concavity, the os being difficult or impossible to reach. If the bladder is distended the abdominal walls are unusually tense and painful to the touch; on percussion the bladder may be detected as a fluctuating tumour, occupying the normal position of the gravid uterus at the sixth or seventh month. The depression of the fundus uteri produces a very characteristic bulging of the anus and perineum.

In *retroflexion* the cervix uteri, though forced against the symphysis pubis, retains its downward direction ; the urethra is not elongated, and consequently urinary retention is less frequent than in retroversion ; the perineal bulging is also less marked.

The cause of this displacement used to be attributed solely to the distended bladder pushing the uterus backwards. I agree with Tyler Smith that the malposition frequently exists before impregnation, but remains unnoticed until the increasing size of the uterus evokes the usual symptoms, when, for the first time, it is recognised. The symptoms are, obstinate constipation of the bowels, and inability, accompanied with a great desire, to pass water, and if the bladder is not relieved, the usual train of symptoms pertaining to prolonged distension of that viscus sets in, the kidneys become implicated, and uræmic symptoms supervene. The fundus uteri may be felt by the finger in the vagina, but, as previously stated, the os being situated high up behind the pubis, is difficult to reach ; an examination, per rectum, reveals the fundus pressing on the bowel. The *Treatment* consists in first emptying the bladder with a male elastic catheter, which must be directed upwards as far as it will go close behind the symphysis pubis, and then in evacuating the rectum by the use of enemata. The patient should be placed on her left side, chloroform being administered, and the fundus should be replaced by passing the finger, or, if necessary, the hand, into the vagina and applying the requisite force. Should the womb ascend it will take a direction coincident with one or other of the oblique diameters of the pelvis, thereby avoiding the promontory of the sacrum ; when the direction has been ascertained, the pressure should be continued in accordance with the line of ascent. If this method

fail, the patient may be placed on her hands and knees, and pressure made on the fundus by introducing the forefinger of the left hand into the rectum, whilst an attempt is made with the finger of the right hand in the vagina to draw back the cervix to its normal position. Dr. Skinner points out that the reducing power should be applied so as to cause the uterus to ascend in the left oblique diameter of the pelvis: this is accomplished by drawing the cervix backwards to the right acetabulum, and at the same time pushing the fundus towards the left sacro-iliac synchondrosis. It may be necessary to repeat the manoeuvre three or four times before it answers. In obstinate cases continuous hydraulic pressure may be resorted to by introducing into the vagina or rectum a large-sized Barnes' bag, and then distending it with water; by this means an equable constant pressure can be brought to bear for many hours, which will sometimes be successful when manual pressure fails. After reduction the recumbent position should be observed for some days, the bowels and bladder being carefully attended to, and before the patient is allowed to go about, the uterus should be kept in position by means of a pessary. In very rare instances it is impossible to effect reduction. In this emergency the size of the uterus should be reduced by puncturing the membranes through the os uteri if it can be reached; or, if this cannot be done and the case is very urgent, it has been recommended to puncture them through the uterine walls. Abortion, of course, follows either operation. Dr. Gervis, in vol. xvi. of the *Obstetrical Transactions*, in contradistinction to the temporising treatment of most authors, strongly insists upon the early replacement of the retroverted uterus.

A curious condition called *Spurious Pregnancy* may

be mentioned here, although it cannot be classed amongst the diseases of pregnancy. In well-marked cases of spurious pregnancy, not only have we abdominal enlargement, but several other symptoms of the gravid state, as sickness, capricious appetite, fullness of the breasts, with the usual changes in the areolæ, and sometimes cessation of the menses. As these symptoms all point markedly to the gravid state, considerable discrimination is called for to avoid falling into error. Medical advice is not generally sought until the enlargement has advanced to a considerable extent, when vaginal examination will reveal an undeveloped uterus, with the abdominal appearances, perhaps, of the last months of pregnancy; but on putting the patient under chloroform, the abdomen will fall to its normal size thus settling the question beyond dispute.

## CHAPTER XII.

## ABORTION.

ABORTION, in the wide sense of the term, consists in the expulsion of the contents of the gravid uterus within the period of time occupied by normal gestation. Distinction is usually made between non-viable and viable children. In the case of the non-viable, pregnancy is terminated before the seventh month, constituting abortion proper. The birth of viable children is included in the interval between the seventh month and any period short of the full nine months, and is called premature labour. Abortion is more liable to occur during the early stage of pregnancy, as the ovum is then less firmly attached to the decidua; for the same reason an early abortion is not usually attended with much discomfort to the patient, as the contents of the uterus come away *en masse* in the form of a clot of blood, the symptoms differing little, if any, from a profuse catamenial discharge. In abortion up to the third month the ovum frequently comes away with the membranes unruptured. The menstrual nixus is a period also favourable for the occurrence of abortion. Women who have previously borne children are more liable to abort than women who are pregnant for the first time; if a woman aborts more than once she is very prone to repetitions of this evil in future pregnancies. During the intermediate months of pregnancy abor-



tion is liable to be followed by violent hæmorrhage, which is frequently kept up by the difficulty experienced in extracting the membranes and placenta. The patient and her friends generally attribute abortion to some immediate exciting cause, emotional or physical ; but in the great majority of cases it is due, I am disposed to think, to a morbid condition of either the uterus or its contents predisposing to premature expulsion of the foetus. In corroboration of this view, witness the numerous cases on record of pregnant women who have met with severe accidents, as falling out of windows, sustaining fractures of the ribs, and bones of the legs, etc., and who yet have gone to the full time. Cases of a like nature, though perhaps less severe in degree, occur frequently without inducing abortion. The causes of abortion are conveniently divided into those which originate in the maternal, and in the foetal organism. Women of nervous and delicate constitution, and women who belong to the richer grade of society, are more liable to abort than women belonging to the working-class. Violent mental emotion, sudden changes of temperature, accidents, drastic purgatives, intestinal and cutaneous irritation, etc., will induce reflex action and uterine contraction, the foetus being unaffected ; zymotic diseases, lead, carbonic oxide, and other toxic influences, and, more frequently than all these combined—syphilis, tend to produce death of the foetus, and thus centrally bring about abortion. The so-called “habit” of aborting is acquired by some women, who expel the foetus during many consecutive pregnancies at or about the same period ; and cases, indeed, are recorded where this has happened twenty times in succession. Of these cases, many no doubt arise simply from the effect of constitutional syphilis, and under mercurial treatment

the "habit" ceases. Abortion is caused likewise by congestion, retroversion, cancer, and other affections of the uterus. Dr. J. J. Phillips, in a paper in the *Obstetrical Transactions* for 1872, makes special mention of retroflexion of the uterus as an important factor in the causation of abortion; and several cases have come under my own notice of premature expulsion of the ovum repeatedly occurring in the same woman, apparently from this cause. The use of a Hodge's pessary will often enable the uterus to carry its contents to the full time.

A variety of diseases may destroy the foetus whilst in the uterus, and thus induce abortion. The membranes and placenta too are specially prone to take on morbid action; fatty degeneration and inflammation of the placenta, by interfering with the nutrition of the foetus, cause its death; so also does effusion of blood within the substance of the placenta. The investigations of Dr. Barnes show that the fatty deposit is confined chiefly to the cells of the villi and to the coats of the vessels which ramify in them, and that this condition seriously interferes with the nourishment of the foetus; for, when this change is far advanced, the vascular loops become so blocked up by the fatty deposit as to be unable to transmit the blood. Rupture of the vascular walls is also liable to take place, causing extravasation, which gradually separates the placenta from its attachment. Blood may escape between the decidua vera and the uterine parietes, or between the decidua vera and the decidua reflexa. The amount of blood effused and its situation determine the question of abortion. If the amount is small, or if it comes from the lower part of the decidua vera and escapes without much detachment of the membranes, the ovum may be retained to the full period. If, on the other hand, the

quantity of blood is large, or there is much separation of the membranes, abortion will ensue. If, after considerable detachment of the membranes, the ovum remains for some time in utero the result (as shown in Chap. xiii.) is the formation of a fleshy mole. The disease most commonly affecting the ovum is syphilis, which may be derived from either the mother or the father. The woman infected with a primary sore may transmit the disease to the foetus; or, after disappearance of the primary disease in the man, and even of the secondary symptoms, so far as they are manifest to the eye, it may be communicated by him to the embryo, which in its turn may transmit the poison to the mother by means of the placental circulation. Although the foetal and maternal blood currents do not actually meet, yet the infection will pass through the separating membrane and will communicate secondary syphilis to the mother although she has not undergone the primary disease. The existence of endometritis at the time of conception tends to produce hypertrophy of the decidua, which, if excessive, causes atrophy of the foetus and subsequent abortion. Imperfect development, or atrophy of the decidua, is another cause of abortion.

*The Symptoms* of abortion vary with the period of its occurrence. In the early months the symptoms are slight; but during the later months abortion is a much more serious matter. The patient is, perhaps, suddenly attacked with hæmorrhage and uterine pain, or hæmorrhage without pain. If the pain returns at intervals and an examination reveals that the uterus is contracting, that the membranes can be felt through the os, and that they become tense and protrude with each pain, abortion is imminent. The foetus and membranes may come away together or separately. If the foetus is expelled alone the case is often very

troublesome, for hæmorrhage will persist until the retained placenta is expelled or extracted; or, if there is no hæmorrhage, the patient may suffer from the effects of absorption of septic matter. Facial pallor, with lividity under the eyes, lassitude and a sensation of weight in the pelvis, together with pain in the back, are indications that the foetus has been dead for some time. A bloody discharge, issuing day by day in small quantities, may continue for weeks before actual abortion takes place. The breasts and abdomen become flaccid, and there is often a foetid discharge from the vagina.

In twin pregnancies one foetus may be aborted, the other go on to the full time; but, as a rule, both embryos are expelled together.

*Diagnosis.*—In the early months, as was previously stated, the symptoms with respect to hæmorrhage and pain are very similar to those of profuse and painful menstruation; and nothing but expulsion and detection of the ovum will complete the diagnosis. In the latter months the discharge may be mistaken for that produced by uterine polypus, placenta prævia, etc. If the os is open, a digital examination carefully made will materially assist the diagnosis. It is well to regard hæmorrhage during pregnancy as a probable indication of incipient abortion.

*The Prognosis* during the early months is favourable; during the middle months less favourable, owing to the probability of hæmorrhage, together with the fact that the little-developed uterus is in a condition unfavourable for operative interference should any be needed; still later on, towards the approach of normal gestation, the prognosis again becomes more favourable.

*Treatment.*—To avert threatened abortion, the cause, if discoverable, should be removed, and the

patient kept recumbent. Dietetic rules should be carefully observed. Effervescing drinks will be grateful to the patient, if thirsty. Large doses of opium, either by mouth or rectum, are recommended by Tanner, or preferably, in some cases, the subcutaneous injection of morphia; astringents, as the mineral acids, or gallic acid, sometimes seem of service where the hæmorrhage is slight. If the hæmorrhage is troublesome and the ovum can be felt protruding through a dilated os, all hope of stopping abortion must be given up, and we must forthwith endeavour to procure speedy expulsion of the uterine contents. In very severe hæmorrhage the vagina or cervix uteri must be plugged, by the aid of a speculum, with strips of lint or cotton wool. Schroeder's convenient plan is to place a large piece of linen over the external opening of the speculum after its introduction, and then to place other smaller pieces on it, and thus the series of layers is pushed down to the cervix, and the speculum being withdrawn leaves the tampon enclosed in a kind of linen bag, so that the whole compact mass can be withdrawn in one piece.

Sometimes, even after the necessity of using the tampon, the uterus recovers itself and retains its contents to the full time; more frequently, however, on withdrawing the tampon the os will be found dilated sufficiently to admit of the necessary manipulation for extraction.

When the ovum and its membranes are detached from the uterine walls they should be removed at once, otherwise they undergo decomposition and form a nidus for septic contagion. Extraction is effected by hooking one or two fingers of the right hand round the ovum and gently withdrawing it, taking care to leave nothing behind; the left hand is simultaneously placed upon the abdomen and employed in

pressing the uterus down into the pelvis. If extraction cannot be thus accomplished, the ovum-forceps should be tried, or a wire loop such as is used in the extraction of small uterine polypi. When the abdominal walls are resistant, or loaded with fat, Professor A. R. Simpson recommends that one of the lips of the uterus, usually the anterior, should be seized with a vulsellum and the uterus dragged down so as to bring it within reach of the fingers, the patient being previously anæsthetised.

If the placenta is retained, it must be removed if possible by the fingers or forceps, preferably by the fingers; if the os is closed it must be first dilated by a laminaria tent. Ergot may be administered if needful, with a view to provoke uterine action. Dr. Priestley, in an elaborate paper published in the *Obstetrical Transactions*, vol. iii., after describing the evils, such as prolonged hæmorrhage and septic poisoning, produced by the retention of the placenta in cases of abortion, strongly advocates extraction by the

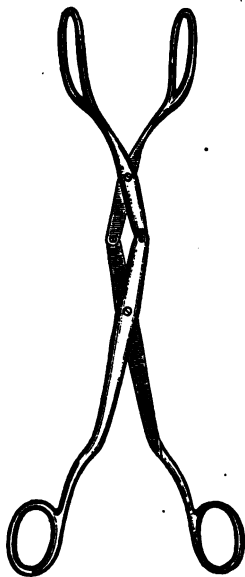


Fig. 80.—IMPROVED OVUM-FORCEPS.

fingers, as with due care the risk is much less than that incurred by long retention of the placenta. The patient being anæsthetised and placed on her back with the thighs flexed on the abdomen, one hand is introduced into the vagina, the other being placed over the fundus to steady the uterus. If the os uteri

is closed, it is gradually dilated by passing first the forefinger into the orifice and then the second, until in a little time the os yields, enabling the placenta to be reached, which is then separated in the ordinary way. It is important to ascertain that the placenta and membranes are entirely loosened from their attachments before withdrawing the hand. Dr. Priestley approximatively limits the period of non-interference to six hours after expulsion of the fœtus, after which (and earlier if there is much discharge) he advocates the manipulation just described.

*Prophylactic Treatment.*—An endeavour should be made to ascertain the cause of the abortion. If traceable to syphilis, the patient should be put under a course of mercury, iodide of potassium, tonics, and gentle exercise, together with a change of air, especially to the sea-side; if necessary, her husband should also undergo specific treatment. If she is too plethoric, purgatives, open-air exercise, bathing, etc., will be of service; if it is a case of so-called "habitual" abortion, abstinence from intercourse and the internal administration of chlorate of potass in full doses (15 grains) twice daily for some time may be tried.

## CHAPTER XIII.

## DISEASES OF THE MEMBRANES OF THE OVUM.

THE membranes of the ovum occasionally take on some form of degeneration, fatty, carneous, hydatidiform, etc., the result being the formation of a *mole*. Distinction must be made between the fibrinous clots and exfoliated mucous membrane sometimes expelled from the virgin uterus, called *false moles*, and those formations which are the result of impregnation, termed *true moles*. The formation of a *fleshy mole* takes place if the embryo dies during the early period of utero-gestation and is for a time retained within the uterus, the membranes continuing in an abnormal form of development whilst the foetus atrophies and is absorbed, so that on expulsion of the mass no trace of the foetus can be found. The first step in the formation of a fleshy mole is extravasation of blood within the uterus, taking place usually between the uterine parietes and the decidua vera, thus cutting off the supply of blood to the foetus and detaching the membranes from the uterus. The hæmoglobin of the effused blood is absorbed, the fibrin becomes organised and converted into connective tissue, which then forms the channel of communication between the uterus and the membranes. It is probable that the effused blood does not entirely detach the decidua, a small portion of it retaining its original connection with the uterus, and although



insufficient to nourish the foetus, this communication will serve to supply the decidua until the extravasated blood is organised. When the morbid action is chiefly confined to the chorion, and takes the shape of vesicular degeneration of its villi, small bladders or vesicles, containing a clear limpid fluid, attached to each other in countless profusion, form a *hydatid mole*. The pathological changes in the villi are initiated by proliferation of the epithelial cells which line their interior; the villi thus distended are afterwards filled with fluid from rupture of the cells. The natural tendency of the villi to development continues in this perverted form until the cavity of the uterus is filled with vesicles growing from each other, varying from the size of a pin's head to that of a hothouse grape, or even larger. Some observers hold that hydatidiform degeneration of the chorion is invariably preceded by death of the foetus, the vital force being then solely expended on abnormal development of the villi; others are of opinion that the primary cause originates in the maternal organism; the question is not easy to decide; the probability being that both theories are correct. Sometimes vast quantities of these hydatids are discharged from the uterus, causing hæmorrhage of an alarming kind. Uterine hydatids were formerly considered to originate independently of impregnation, and consequently might be discharged from the virgin uterus, but the pathology of this abnormality, as described by Dr. Graily Hewitt, proves that they are the direct sequence of impregnation, resulting from morbid action being set up in one of the products of conception. It must be remembered, however, that the echinococcus—the true hydatid—*may* be evacuated by the uterus, and this, it need hardly be remarked, is not a product of conception. Care therefore must

be exercised not to impugn recklessly the chastity of a woman who has discharged what appears to be a vesicular mole, but which *may* be a bunch of real



Fig. 81.—HYDATID MOLE.

hydatids. The microscope should be resorted to in cases of doubt, the hooklets of the echinococci, once seen, affording absolute proof as to the nature of the

growth. It must also be borne in mind that a true hydatid mole, or a portion of one, may be retained in utero for months or even years—a fact having an important bearing with regard to widows or to women separated from their husbands. The vesicular mole is usually discharged from the uterus not later than the sixth month ; if it remains for a much longer period it frequently gives rise to prolonged and dangerous hæmorrhage. The symptoms of molar pregnancy are not very pronounced ; stoppage of menses, enlargement of the mammæ, sickness, and other signs of pregnancy occur during the early period. These symptoms later on disappear, but the patient suffers from a sensation of dead weight in the uterus, and a general feeling of *malaise*. When the uterus endeavours to expel its contents, more or less hæmorrhage takes place, and if a portion of a hydatid chance to come away, the nature of the case is of course satisfactorily proved. The treatment consists in restraining hæmorrhage and assisting the uterus in its expulsatory efforts ; in plugging the vagina, if the hæmorrhage is great, together with the internal administration of ergot ; and, if it be possible to dilate the os uteri, in detaching and bringing away the mass with the fingers.

*Dropsy of the Amnion* consists in an excess of liquor amnii, which, beyond adding to the size of the uterus and consequently to the inconvenience of the mother, is not usually productive of ill effects. Occasionally, however, the quantity of fluid is so excessive as to endanger life, by interfering with the action of the lungs or heart ; the only treatment is to puncture the membranes, which of course induces premature labour and is therefore permissible only when it is obvious that the patient cannot otherwise survive to the full term. The converse of this, namely deficiency of the

liquor amnii, may cause union to take place between the amnion and the external surface of the fœtus. A discharge of fluid sometimes occurs previous to rupture of the membranes, to which the name *Hydorrhœa* has been given. The fluid, which is clear and watery, comes away either slowly, drop by drop, or in a sudden gush, which may be repeated at intervals. *Hydorrhœa* is most common in the later months of pregnancy, but it may occur at intervals during the whole period of utero-gestation. The discharge is unattended with pain, and will often come on when the patient is perfectly quiescent. Its origin is somewhat doubtful, probably it is secreted between the amnion and chorion; some consider that it is lodged between the decidua vera and the uterine parietes. The possibility of this extra-ovular discharge taking place should be borne in mind when a painless escape of fluid occurs about the period of labour, since uterine action may not set in for some time after. The *placenta* is liable to congestion and inflammation, which may interfere with a due supply of blood to the fœtus. Blood is occasionally effused between the maternal and fœtal vessels, giving rise to what has been called *apoplexy of the placenta*. Fatty degeneration, by no means of rare occurrence, is probably often the cause of abortion. According to Dr. Druitt, fatty degeneracy exists at the end of pregnancy to a limited extent in all cases. When this change occurs at an early stage of pregnancy, the embryo, deprived of its nourishment, dies and becomes absorbed, the uterine contents being afterwards expelled in the form of a mole.

## CHAPTER XIV.

## MULTIPLE PREGNANCY.

IN the human female the process of utero-gestation usually terminates in the birth of a single child ; in a certain proportion of cases, however, women give birth to twins, more rarely triplets, and still more rarely quadruplets. Plural pregnancies are abnormal, inasmuch as the children resulting therefrom are subject to much higher rates of mortality and disease both mental and physical than are children born singly ; moreover the risk to both mother and child is greater in multiple than in single pregnancy. In this country twins occur in the proportion of about 1 in 80 cases ; triplets about 1 in 6000. Twins are most frequently of opposite sexes ; when of the same sex, females predominate over males. The tendency to multiple pregnancy is hereditary to a marked extent, the females of families thus gifted being very prone to the production of twins, and apart from this hereditary proclivity, women who have once borne twins are more liable to plural pregnancies than women who have not. In plural births the children are smaller and feebler than those born singly : in twin cases it is not unusual to find one foetus much more developed than the other : sometimes one foetus dies and is expelled, the living foetus being retained to the full term : or the dead foetus may shrivel up and harden, and in this state remain in the uterus until the birth

of the living child. The duration of pregnancy in twin cases is usually shorter than the normal period. Ordinarily the children are born within a short interval of each other, but occasionally the interval is prolonged over several hours, and very exceptionally it has been known to last weeks, or even months. The mortality of infants is much greater in plural than in single births, being in the case of twins about one in twelve.

The cause of multiple pregnancy originates in some deviation from the normal physiological action of the ovaries; two Graafian follicles in one ovary, or one in each ovary, may mature and rupture at the same time; or, one follicle may discharge two ovules; or, again, a single ovule may contain two germs; in any of these cases it is quite possible for the two ovules or germs to be fecundated by one insemination, resulting in the formation of twins. In the two instances first mentioned where the ovules are separate and distinct, each embryo has its own amnion, chorion, and placenta, the latter being sometimes matted together but without any intercommunication of vessels. In the early stage of development the ova are surrounded by their respective deciduæ reflexæ; the partition between the two amniotic cavities being thus built up of six distinct membranes, namely two layers of decidua, two layers of chorion, and two layers of amnion. As the ovular membranes enlarge, the two layers of decidua reflexa become more or less absorbed from pressure against each other, the partition between the two embryos then consisting of only four membranes—the amnion and chorion of each embryo. When twins are developed from a single ovule having two germs, they are enclosed in one common chorion surrounded by the decidua; the partition in such cases consists solely of

two layers of amnion, one surrounding each foetus ; in very rare cases the partition thus formed is destroyed at some period of utero-gestation, leaving the two embryos enclosed within the same amniotic cavity.

The diagnosis of dual pregnancy previous to delivery is difficult. Sometimes, in thin women, the presence of twins may be detected by palpation, and occasionally the two foetal hearts may be differentiated either by a difference in the rapidity of their respective beats, or by their position, as when two distinct and separate spots exist on the maternal abdomen where the foetal heart sounds can be plainly heard, the sounds dying out in the intermediate space.

In ordinary twin cases a single coitus has fecundated two ovules at the same time. This dual impregnation may, however, be the result of two separate acts of intercourse, constituting either *superfecundation* or *superfoetation*. If an ovule escapes from a Graafian follicle at the time of, or shortly after, coitus, and is fecundated, a second ovule may present itself, and remain exempt from the influence of the previous intercourse ; it can, therefore, only be impregnated by a second insemination ; this is called *superfecundation*. From time to time cases strongly in favour of the possibility of the separate impregnation of two ovules have been reported ; the most striking instances are those where twins have been born, the one child being white and the other black, resulting from the immediately successive intercourse of two males, a white and a black, with the same white woman ; the question, indeed, does not admit of doubt. *Superfoetation*, on the other hand—that is, impregnation of a second ovule *after the formation of the decidua*, has been considered by many writers to be physically impossible. The opponents of superfoetation explain the

cases usually cited in its favour as resulting either from ordinary twin impregnation, one foetus being developed in excess of the other, or from the existence of a bifid or double uterus. In the latter case it is very easy to understand how each division of the organ may be separately impregnated, and a more or less extended interval of time elapse between the expulsion of the contents of the respective cavities. If, however, previous to the union of the decidua vera and decidua reflexa the condition of the gravid uterus is examined, no positive barrier is found to the passage of either the ovule or spermatozoa into the uterus, the openings of the Fallopian tubes and cervical canal being still patent. The canal is, indeed, plugged with thick mucus, but this differs but slightly from the mucus which is found in this situation in the unimpregnated state, and will offer no obstruction to the spermatic filaments. It appears, then, that as there is no mechanical obstacle to superfœtation, the rarity of its occurrence must be otherwise explained. It will perhaps be remembered that in the section on ovarian physiology it was stated that during pregnancy no Graafian follicles are ruptured, and consequently no ovule escapes—a fact in itself sufficient to prevent the occurrence of superfœtation; so that in the few cases of superfœtation this exceptional act of ovulation must take place. Thus it is evident that superfœtation is possible up to the third month of uterogestation, when the union of the decidua vera and decidua reflexa takes place, but that later it is impossible.



## CHAPTER XV.

### EXTRA-UTERINE PREGNANCY.

THE fecundation and development of an ovule external to the cavity of the uterus is an accident fortunately of rare occurrence, and, as might be supposed, necessarily very fatal in its result. The ovule may be fecundated and arrested at any point of its transit from the ovary to the junction of



Fig. 82.—CASE OF TUBAL GESTATION.

the Fallopian tube with the uterus. Cases of this kind are divided into *ovarian*, *ventral*, and *tubal* pregnancy, and further subdivided according to the exact position where the development of the ovum takes place.

The rarity of this form of pregnancy may be accounted for by the misplaced ovum becoming absorbed when the site to which it adheres is unable to

afford the requisite amount of nourishment for its development. It is held by some that impregnation is possible prior to rupture of the Graafian follicle, as it has been found that the external envelope of the foetus has been formed out of the ovarian tunic, and that this, therefore, is the true form of *ovarian* pregnancy; it is more probable that rupture has taken place, and that after fecundation the aperture closes and the ovum remains within the follicle, and there undergoes development. Those cases where the ovum fixes itself to the external surface of the ovary, to which organ the placenta is primarily attached, may be included under the head of ovarian pregnancy. When the ovum drops into the peritoneal cavity and



Fig. 83.—CASE OF TUBAL GESTATION.  
(From a preparation in my own Collection.)

attaches itself to some of the abdominal organs, *ventral* pregnancy is the result; in some cases the ovum is originally attached to a part of one of the Fallopian tubes, and after there undergoing a certain degree of development, is, through rupture of the cyst, transferred to the abdominal cavity. These two varieties are known respectively as primary and secondary ventral pregnancy. When the ovum is arrested in the Fallopian tube, the most frequent form of this

abnormality, *tubal* pregnancy, ensues. There is another form of abnormal gestation in which the ovum, arrested at the junction of the Fallopian tube with the uterus, is developed within the substance of the uterine walls, giving rise to *interstitial* pregnancy. In all varieties of extra-uterine pregnancy the foetus is surrounded by its own proper membranes, that is, by those derived from the embryo itself, namely, the amnion and the chorion. In the tubal form the maternal membranes are represented by a kind of spurious decidua produced from the mucous membrane lining the Fallopian tube, but in abdominal pregnancy there is no structure from which this covering can be derived, so that the chorion forms



Fig. 84.—UTERUS AND FŒTUS IN A CASE OF ABDOMINAL PREGNANCY.

the sole external envelope. In whatever position the ovum becomes attached, the maternal vessels in its immediate neighbourhood enlarge and play the part of the uterine vessels in normal pregnancy ; the villi

of the chorion ingraft themselves on the spot where the ovum is located, and eventually form a placenta through which the maternal vessels supply nourishment to the foetus. The absence of tubular glands, such as are present in the uterine mucous membrane, prevents the chorionic villi from obtaining a firm hold, which accounts for the erratic attacks of hæmorrhage not unfrequently met with in cases of extra-uterine pregnancy; there is no formation of decidua reflexa in these cases. In all forms of extra-uterine pregnancy the uterus undergoes for a time the usual development pertaining to the gravid state; the mucous membrane hypertrophies and the muscular coat enlarges, but, owing to the absence of the stimulus afforded by the presence of the ovum, the organ, after a certain degree of development, either remains stationary or resumes its ordinary condition. In some cases the development of the uterine mucous membrane goes on to the formation of a complete decidua vera, which is cast off and expelled per vaginam.

The *causes* of extra-uterine pregnancy are somewhat obscure, being arrived at by deduction rather than by observation. Cases have been recorded in which fright, or sudden shocks, or blows on the abdomen, at or about the time of conception, have been the only assignable reasons. Obstructions of a passively mechanical nature are probably more frequent factors. Amongst these may be enumerated inflammation of the uterus and its appendages, or of the tissues in the immediate neighbourhood of these organs, producing either thickening of the walls of the Fallopian tubes, which, by encroaching on their internal diameter, impedes the passage of the ovule without preventing the transmission of the spermatozoa, or adhesions, which, interfering with the free movement of the Fallopian tubes, prevent perfect

apposition of their fimbriæ to the ovaries, and thus allow the fecundated ovum to escape into the abdominal cavity. Instances are recorded where a foetus has been found in one of the Fallopian tubes, the resultant corpus luteum being contained in the ovary of the opposite side. Various attempts have been made to account for this extraordinary circumstance ; some believe that by the action of the uterine cilia, or by spasmodic contraction of the womb itself, the ovum was propelled across the cavity of the uterus into the opposite Fallopian tube ; others think that the Fallopian tube of one side twisted itself over to the ovary of the opposite side, and received the ovum directly into its fimbriæ but failed to transfer it to the uterus.

The *Symptoms* during the earlier period of extra-uterine pregnancy are obscure, but in addition to the

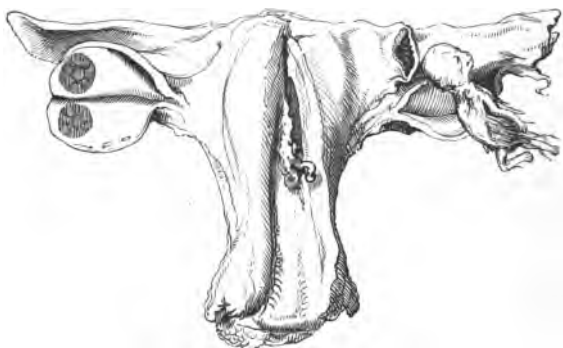


Fig. 85.—TUBAL PREGNANCY, WITH THE CORPUS LUTEUM IN THE OVARY OF THE OPPOSITE SIDE. The Decidua is represented in process of detachment from the uterine cavity. (After Tyler Smith.)

usual signs of pregnancy, there is often pain of a more or less local nature caused by the increase in bulk of the misplaced ovum. Ventral pregnancy will

frequently go on to the full period, as there is nothing to hinder the increase in foetal bulk ; but if the ovum is lodged within the Fallopian tube rupture of the sac usually takes place before the fourth month, causing intense suffering, and the patient quickly dies in a state of collapse. The causes of rupture of the cyst in the earlier months are—over distension from simple development ; and separation of the placenta, causing hæmorrhage into the sac, and consequent rupture from internal tension.

Dr. Parry in his valuable and exhaustive monograph draws the following picture of a case of extra-uterine pregnancy. For the first six or eight weeks all may go on as in a normal pregnancy, when suddenly the patient is seized with violent colicky pains, usually on one side of the abdomen. These pains are attended by extreme prostration—threadlike pulse, cold surface, clammy sweats, and not unfrequently, vomiting. After an interval of from a few hours to one or two days, the patient recovers, to be again the victim of similar attacks every two or three weeks. These paroxysms are probably due to contractions of the foetal cyst.

An occasional and significant symptom of hæmorrhage from the vagina, metrorrhagic in character, accompanies these pains. Sometimes in the early stage of gestation the decidua is expelled, giving rise to the suspicion of abortion. The discharged substances should therefore be carefully examined for the ovum. Vaginal examination reveals changes in the uterus corresponding to those of the early months of pregnancy which, however, never exceed the development at the fifth month of normal gestation. After quickening, preternatural intensity of the foetal heart sounds are very suspicious and always indicate the necessity of careful combined internal and external examination,

and if the patient is too sensitive to endure this she must be put under the influence of an anæsthetic. Sometimes a tumour, which ballottement proves to contain a movable body, is found alongside or behind the uterus. It has been recommended to dilate the urethra so as to enable the index finger to pass into the bladder, and thus with the aid of the index finger of the other hand in the vagina or rectum to explore the fundus uteri and Fallopian tubes. The foetal cyst generally displaces the uterus so that the os is more or less out of the reach of the finger. The possibility of pelvic hæmatocele should be borne in mind. It is sometimes difficult to distinguish extra-uterine from intra-uterine pregnancy when the latter is attended with certain complications, as, for example, the impregnation of one horn of a bicorned uterus. Dr. Greenhalgh relates how several medical men of much experience, mistaking a fibrous tumour of the uterus for a case of extra-uterine pregnancy, were about to perform gastrotomy, when a living child was expelled per vaginam.

If the patient arrives at the full term, pains, resembling those of ordinary labour, come on, sometimes attended with vaginal hæmorrhage. In the majority of cases these pains do not cause rupture of the cyst. If rupture does take place the patient feels as though "something had given way in her inside;" this is followed by immediate and profound collapse, and prolonged syncope, convulsions, and delirium may severally supervene. There is abdominal pain of the most severe character. The patient may die at once, or more frequently she may live several days, the abdomen becoming tympanitic, the pulse quick with elevation of temperature. These symptoms are usually attributed to acute peritonitis, but Dr. Parry states that an analysis of the post-mortem

examination made in cases of rupture of the cyst shows that peritonitis is a rare sequel. The child dies about the time of this quasi-parturient crisis or shortly after (even when the sac remains unruptured); the body, if retained, becomes mummified or converted into a substance resembling adipocere; in some cases it undergoes calcification, or in rare instances it may remain for a considerable time nearly if not quite unchanged. In one or other of these conditions the foetus may remain encysted in the maternal abdomen for an indefinite period—twenty or thirty years, or, according to the record of one case, even over half a century. In other cases “nature makes an effort” to cast off what is now a foreign body. By inflammatory processes more or less acute portions of the foetus slowly make their way by ulceration through the intervening tissues to be discharged through the bowels, the abdominal walls, the vagina, or the bladder. According to an analysis of five hundred cases by Dr. Parry, the relative frequency of the exit of the foetus was—into the bowels, 26·2 per cent; through the abdominal walls, 16·12 per cent; into the vagina, 4·83 per cent; and into the bladder, 3·62 per cent. These attempts at evacuation are most frequently initiated during the first six months after the death of the foetus. Dr. Parry gives the mortality of extra-uterine pregnancy as 67·2 per cent. Tubal pregnancy is the most fatal, ventral the least so.

*Treatment.*—When an early diagnosis is established the indications are to destroy the vitality of the ovum and thus prevent further growth. Attempts have been made to accomplish this by various means; by the administration of strychnine or ergotine to the mother so as to reach the embryo through the circulation; by puncture of the cyst with or without the



injection into it of morphia or other narcotic ; by passing shocks or a current of electricity through the sac either per-cutaneously or by means of electrolytic needles ; and lastly, by gastrotomy. Dr. Parry lays down the axiom that in order to procure retention of the embryo as an innocuous body within the maternal abdomen the cyst must be left intact, otherwise, in place of desiccation, decomposition sets in ; therefore the child ought either to be removed entire or the cyst allowed to remain uninjured. The dangers of puncture are hæmorrhage and septicæmia. Hæmorrhage might possibly be avoided by using a very fine hollow needle. Septicæmia produced by decomposition of the foetus is probably due not to the admission of air, but to the introduction of germs by the instrument used to perforate the cyst. With a very fine hollow needle, carefully freed from micro-organisms, the skin of the part about to be punctured being also well cleansed with carbolic wash—in a word, if the operation is conducted on strictly anti-septic principles, it would probably be found that the risk of septicæmia is not so great as has hitherto been supposed. There is, however, a more valid objection to simple withdrawal of the liquor amnii ; the embryo is not thereby necessarily deprived of life, and this consideration, with the possibility of septicæmia, renders the operation unadvisable. The injection of narcotics is open to the same objection ; moreover, it necessitates the introduction into the sac of a fluid containing micro-organisms likely to induce decomposition, for practically it would be impossible to sterilize the fluid to be injected. Electricity, if transmitted by needles, is for the foregoing reasons also objectionable. The objection, however, is obviated if an insulated electrode in the vagina or rectum is placed in contact with the cyst, the other electrode

being placed on the abdominal walls. For the purpose under discussion I should be disposed to use static electricity, as the discharge of a small Leyden jar would be more likely to destroy the vitality of the embryo than a succession of induced currents. Keller raises a feasible objection to the use of electricity in any form—the danger of causing separation of the placenta through muscular contraction. Apart from Keller's purely hypothetical objection, the treatment by electricity, being free from risk, merits further trial. Vaginal section with the galvanic cautery, devised by Dr. Thomas, as yet has been only once performed; the case was successful, but further experience is necessary to establish the merits of the operation. Gastrotomy and removal of the ovum before rupture of the sac appears a very rational mode of dealing with cases of ovarian and tubal gestation; unfortunately the difficulty of absolute diagnosis is an insuperable obstacle to its employment. At present the bulk of opinion is against such an operation. After rupture of the cyst, in the early months, I would strongly advise the performance of abdominal section with all the well-known precautions adopted in ordinary cases of ovariectomy. In this phase of abnormal gestation we are confronted face to face with a condition which may be regarded as certain death, the chance of recovery being infinitely small. There need be therefore now no hesitation in dealing with such a case, for only prompt and bold measures can save the patient's life. An incision is made through the abdominal walls in the median line, the divided vessels being twisted or tied before the peritoneum is opened. If the case is one of ovarian gestation the whole ovary should be removed, the pedicle being tied as in ordinary ovariectomy; in tubal gestation the ligatures can be passed through the broad liga-

ment. In tubo-uterine gestation it is probably best to remove the uterus and appendages, as there is no other way of securing the bleeding surface. When a case of extra-uterine pregnancy has passed the fourth month the risk of rupture of the cyst is materially diminished. The patient should be watched carefully, and on the advent of pseudo labour she should be placed under the influence of opiates. Unless there is urgent reason—as the rupture of the sac—no surgical measures should be taken at this period. When the puerperal symptoms have subsided and the patient has regained her ordinary condition the question arises, Is she to be left to time and chance, or is she to be relieved of her burden by operation? Authorities differ widely. From my own experience I am strongly disposed to advise abdominal section, which gives the best chance of life to the mother. So long as the foetus remains, so long is the patient liable to dangerous complications—inflammation, septicæmia, or exhaustion from long-continued ulceration and suppuration. The question of saving the child's life ought not to affect the question of an operation. Gastrotomy is performed by making an incision four or five inches in length over the most prominent part of the tumour, through the abdominal parietes, so as to expose the cyst, into which an opening is then made. If the cyst is adherent to the abdominal walls the operation is greatly simplified and the danger lessened. If not the edges of the cyst should be stitched to the sides of the abdominal incision in order to prevent, as far as possible, the escape of any of the contents of the cyst into the peritoneal cavity; the child should then be carefully extracted and the cord, if intact, divided. The placenta should be left, since the risk of hæmorrhage on its removal is very great, owing to an entire absence

of the means existing at the normal site of the placenta to arrest the flow of blood from the mouths of the ruptured vessels. The cyst is generally so completely adherent as to debar any attempts at removal. A case of this kind occurred under the care of my colleague, Dr. Cullingworth, at St. Mary's Hospital. The sac communicated with the intestinal canal, and was universally adherent to the abdominal walls and the surrounding structures so as entirely to preclude removal of the placenta. In a similar and successful case of my own, in St. Mary's Hospital, the placenta was left, the cyst being washed out with a solution of permanganate of potash thrice daily. The cyst should be carefully sponged out and the divided edges of the abdominal walls brought together by sutures, an opening being left at the lowest part (through which the end of the cord should be brought) so as to provide a means of exit for the discharges. When, after the death of the foetus, it is retained for some time, and is slowly seeking exit by ulceration through the abdominal walls, or into one of the hollow viscera—bladder, rectum, or vagina—help may be afforded by enlarging the aperture, if necessary, and by extracting the fragments as they come within reach. No absolute directions can be given, for each case must be treated on its own merits. In the year 1868<sup>1</sup> I collected and tabulated thirty-three cases of gastrotomy performed for extra-uterine pregnancy; of these sixteen mothers recovered, and four children were born alive, showing that the maternal recoveries were nearly 50 per cent. These favourable results, I think, warrant the presumption that gastrotomy may fairly be placed amongst the legitimate operations of surgery.

<sup>1</sup> *Clinical Papers*, Manchester.

## CHAPTER XVI.

## STAGES OF LABOUR.

LABOUR is divided into three stages—1st, dilatation; 2d, expulsion of foetus; 3d, separation and expulsion of the placenta and membranes. At the completion of the period of normal gestation, preparations for the expulsion of the uterine contents begin to manifest themselves, both locally and generally, in the maternal system. The uterus sinks into the pelvis; pain, which after a time becomes periodic, is felt in the loins, abdomen, and hips; there is frequent desire to empty both bowels and bladder, and the patient becomes restless and uneasy, and often suffers from mental depression. On vaginal examination the os uteri is found little, if at all, changed from its previous condition, but after a time, as labour goes on, dilatation commences, and the bag of membranes begins to protrude, feeling tense and firm during a pain, but in the absence of a pain the tension is generally so far relaxed as to allow the presentation to be made out. Sickness is a frequent accompaniment of this stage; often also a kind of shivering fit or rigor marks the full dilatation of the os, and there flows from the vagina a discharge of mucus tinged with blood, called by the nurse "the show," which is good evidence that labour is actually progressing.

During the first stage of labour the pains are of a grinding or tearing nature. They usually commence

in the back and gradually extend to the thighs and abdomen, remaining entirely uterine, the voluntary muscles not as yet being called into requisition, so that the patient is unable to assist herself, and at this stage is generally restless and anxious.

So the labour goes on until the os is fully dilated, when the assistance of the abdominal muscles is evoked, and the pains become of an expulsatory character, and at this period the membranes, having fulfilled their duty in dilating the cervix and os, usually undergo rupture. The pains now increase in strength and duration, the intervals become shorter, the nervous anxiety gives place to physical exertion, and the patient becomes bathed in perspiration, with a flushed and bloated face and accelerated pulse. The foetus, passing through the various evolutions described in *Mechanism of Labour*, gradually moves along the parturient canal until the presenting part rests on the perineum, which, with each pain, undergoes more and more distension, until eventually it becomes so far relaxed and thinned as to allow the head to pass through the vulvo-vaginal opening. A pause now usually takes place ere the uterus, by a final effort, expels the body of the child and completes the second stage of labour. Sometimes there is no pause, for the uterine contractions may prove so vigorous as to drive the child bodily into the world by one violent throe.

A remarkable change is now apparent in the patient's condition; the state of active exertion and urgent pain suddenly subsides into a state of placid inaction and contentment, accompanied with profuse expressions of thankfulness for the release vouchsafed to her from her sufferings.

After an interval of variable duration the uterus, again contracting, detaches the placenta from its walls,

and with it the decidua serotina which remains adherent to the placenta, thus exposing the uterine sinuses and giving rise to the gush of blood which follows the extrusion of the placenta ; the continued contractions of the uterus propel the placenta into the vagina, closing at the same time the open mouths of the uterine sinuses. Although the vagina is competent by its independent contractile efforts to expel the placenta, yet it is usual to remove it by hand when it arrives in the vagina.

The condition of the abdomen and of the organs of generation after delivery affords evidence sufficiently pronounced and trustworthy to enable the practitioner readily to decide whether parturition has, or has not, recently taken place. This question frequently arises in a medico-legal aspect ; in cases of infanticide for example. Immediately after delivery the abdominal walls are wrinkled and flaccid, the extreme and prolonged distension they have recently undergone having stretched the skin to the last limits, and even beyond, for we find that the cutis vera has given way in such a manner as to leave under the epiderm visible fissures which persist throughout life. These fissures, in the absence of other causes for distension, as dropsy, or abdominal tumours, afford presumptive proof of previous pregnancy. During the first week after delivery the uterus may be recognised through the abdominal walls as a hard round ball ; the uterine cavity also may be measured with the sound, care being taken not to penetrate the walls which, at this period of involution, are very friable and easily perforated. During the first four or five days the lochial discharge affords strong evidence of recent childbirth. At first the discharge is coloured with blood, but after the fifth or sixth day it assumes more the appearance of dirty water, day by day

becoming more like the ordinary vaginal discharge, but remaining somewhat yellow for two or three weeks. Cracks and excoriations in the vaginal mucous membrane are indicative of recent delivery, but they soon heal up and disappear. In primiparæ the absence of the fourchette is very suggestive. The presence of milk, together with increased development of the mammary glands, and change of colour in the areolæ, are signs easy of recognition. The investigation, if possible, should be made within a week or ten days after delivery, although indications, sufficient for the purpose, persist for a much longer period.



## CHAPTER XVII.

## MANAGEMENT OF NATURAL LABOUR.

THE practitioner in the lying-in room should possess plenty of patience, or, at all events, the art of concealing any shortcoming in this respect; as, in addition to the discredit which follows any rash treatment he may be led into by lack of patience, he will assuredly be blamed for anything that goes amiss, although it be not his fault. Presence of mind is a very important element, as is also the avoidance of a fussy officious manner which tends to excite the patient. Nowhere is the *suaviter in modo, fortiter in re*, more demanded than in the lying-in chamber.

The summons to a labour should be promptly obeyed, it being good policy to regard every case as one which may possibly require early interference. The arrival of the attendant should be announced to the patient before he reaches her room, else his unexpected advent, especially if he be a stranger, is often sufficient to cause entire cessation of the pains. An early examination being requisite, the subject should be approached by inquiring from the nurse about the character of the pains, etc., after which the patient, if not already in bed, should be requested to lie down on her left side, with her knees drawn up towards the abdomen, and her back towards the attendant. The obstetric position varies in different countries, the above being the one usually preferred

in England. In France, and elsewhere, the patient is delivered on her back. The arrangement of the bed of course devolves upon the nurse, who places a sheet of waterproof cloth under the hips of the patient, and prepares the necessary napkins, thread, scissors, etc. It is well, however, to cast a



Fig. 80.—EXAMINATION IN THE STAGE OF DILATATION.

glance around to see that all is at hand when required. First lubricating the fingers of the right hand with lard, oil, or cold cream, the hand is passed under the bed-clothes and the vulva separated by the thumb and second finger, and the first finger introduced into the vagina and passed up to the os uteri. To the novice this is often a somewhat difficult feat, especially if the vagina is long or the uterus at all

anteverted ; a little quiet perseverance, however, with perhaps the introduction of a second finger, will overcome the difficulty. If the labour is only just commencing the os is found closed, when of course nothing can be made out. The student is warned that it is very difficult to found a diagnosis of the presentation from an examination made through the anterior wall of the uterus. If the os is dilated the membranes will be found protruding at each pain, and the presentation should be sought for during the interval between the pains, but not too energetically lest the membranes be ruptured. After an examination the patient or nurse will inquire whether all is right, that is whether the presentation is natural or otherwise, and the attendant must therefore be prepared to answer. The patient is also likely to ask, "How long shall I be?" This question not being so easy to answer, she should be told that all depends upon the strength and frequency of the pains. If the presentation is natural little is to be done in the way of treatment ; the patient should be cheered and comforted from time to time with the assurance that all is going on well, an occasional examination being made to ascertain that this is really the case. When the os is fully dilated and the membranes still intact, they should be ruptured during a pain by pressure with the finger-nail, when the waters will come away in a gush, and thereby enable the expulsive efforts of the uterus to act more advantageously. In some cases the membranes may be advantageously ruptured before the os is fully dilated. Dr. Stephenson, in advocating this, says that "when we find dilatation tardy from defect in degree or direction of the power alone, and not from any inherent character of the tissues, when once it is evident that the lower segment of the uterus is well expanded, the rupture of

the membranes is the most effectual means of favouring the dilatation, by bringing the axial force into full action, and this irrespective of the degree of the size of the os." Also when the liquor amnii is in excess, producing undue tension of the membranes during a relaxed state of the uterus, the condition "must be regarded as unfavourable to the mechanism of labour and as warranting an earlier rupture of the membranes than under other circumstances."

In the second stage it is usual for the patient during her pains to pull at some object, as a roller-towel fixed to a bedpost, or the hands of the nurse, in order to obtain a fixed point for the action of the abdominal muscles; sometimes the patient aids her efforts by pushing her feet against some resisting object, as the footboard of the bed, and so bringing more voluntary power into action. Pressure applied by the hands of the nurse to the lower part of the back also affords comfort.

The anterior lip of the uterus is sometimes carried down before the descending head, a displacement easily rectified by pushing the lip gently up over the head during an interval between the pains. When the head distends the perineum, graduated pressure may be applied by laying a folded napkin on the hand and pressing on the part. This manœuvre used to be strongly insisted upon, but has latterly fallen into comparative disuse, and Dr. Graily Hewitt, who has written on this subject with considerable fulness, is averse to the procedure, and believes that "in many cases it has led to the very evil it was intended to prevent." During the expulsion of the child the nurse should make firm pressure on the maternal abdomen and follow down the uterus in its final contraction.

As soon as the head is born the trunk quickly

follows, and the next step is to separate the child from the mother by tying the umbilical cord about a couple of inches from the child's abdomen with two or three strands of thread or worsted ; then to apply a second ligature an inch or so nearer the placenta, and to divide the cord between the two. As the gelatinous structure of the cord renders it very elastic, the ligature should be firmly tied, otherwise hæmorrhage will ensue. Before tying the second ligature the blood contained in the portion of the cord between the two ligatures should be pressed out in order to avoid the disagreeable spurt which otherwise occurs on dividing the cord. The attendant should then ascertain the sex and look for any deformity, and carefully inspect the cord to see that the ligature is effectual. The placenta must then be brought away : *if it is already in the vagina*, slight traction at the cord is sufficient to effect this ; but if still within the uterus, other steps must be taken, as traction at the cord then is not only useless but dangerous. The older accoucheurs were accustomed to wait for further uterine contractions, which sometimes did not recur for hours, but still the rule was "wait." This loss of time can usually be avoided by gently but firmly compressing the uterus with the hands, after the method advocated by Credé, the uterus being thereby stimulated to contract and expel the placenta ; this plan repeated twice or thrice at intervals (if necessary) rarely fails unless there are morbid adhesions. The placenta having come away, the uterus should be felt through the abdominal walls, when, if properly contracted, it will seem like a hard round ball just above the pubes. The binder should now be applied with a moderate degree of tightness, so as to support the relaxed abdominal muscles and to exert slight pressure on the uterus.

*Fœtal Asphyxia* may occur from pressure on the cord cutting off the supply of blood to the brain, or from compression of the child's neck producing apoplexy. In such cases the child's mouth should be cleansed and its body sprinkled with cold water, or immersed in warm water, then slapped with a towel and swung in the air. Should these means fail, Sylvester's method should be tried, which consists in drawing out the tongue, placing the child on its back, elevating the arms above the head, and then bringing them down to the sides, so as to make moderate pressure on the thorax, repeating this manoeuvre twenty-five times each minute for at least half an hour.

In the apoplectic form of asphyxia allow one or two teaspoonfuls of blood to flow from the severed cord.

## CHAPTER XVIII.

## THE PUERPERAL STATE.

CLEANLINESS and rest are most important points in the treatment of the puerperal state. After delivery a warm dry napkin should be applied to the vulva, and the part should be frequently sponged with warm water slightly tinctured with Condyl's fluid during the early puerperal state, especially if there is any laceration of the fourchette.

The lochia or discharge which comes from the parturient canal after labour consists first of almost pure blood, then serous fluid, and decidual debris tinged with blood, which, day by day, fades in depth of colour, and after the eighth or ninth day becomes puriform, usually ceasing, in women who suckle, about the third or fourth week. In case of premature stoppage of the discharge, warm water should be thrown up the vagina and hot fomentations applied externally.

It is customary not to change the underclothing of the patient for some hours after delivery, but the change should be effected as soon as she has recovered from the shock, as it tends greatly to promote her comfort. The patient should be kept free from all excitement, the room retained at an even temperature and efficiently ventilated, the light modified by curtains, and, in a word, all the usual precautions of the sick-room observed.

An interval of a week at least should elapse ere

the patient leaves her bed, this time being required for the initiatory processes which the uterus undergoes in returning to its normal state. The physiology of involution of the uterus will be found in the section which treats of the gravid organ. During this period the diet should be light and easy of digestion ; for the first few days it may consist of gruel, beef or other soup, and farinaceous puddings ; after the third or fourth day a mutton chop, or a little chicken may be allowed, either with or without wine or beer. Previously to changing the diet, the bowels, on the third day after delivery, if there has been no previous evacuation, should be opened with castor oil, Gregory's powder, or other aperient ; and when the bowels are obstinate it is often requisite to repeat the aperient on alternate days for some time.

An essential duty during the early puerperal state is to look well after the condition of the bladder, and to inquire on the first and two or three subsequent visits as to the evacuation of this organ. If there is reason to suspect retention of urine, the hand placed on the abdomen will, if the bladder is full, detect its distended contour above the pubes. As dribbling from a full viscus may be mistaken for voluntary micturition, the novice is warned against being satisfied with the assurance of the patient that she passes water, if the symptoms lead him to suspect inaction of the bladder. The evils resulting from prolonged distension of the bladder are so evident that they need not be dwelt on. I have known cases treated for metritis in the most orthodox fashion, the symptoms being solely due to neglect of a paralysed bladder and consequent accumulation of urine ; in such cases the catheter draws away an enormous quantity. Retention is usually met with after tedious labours, when the neck of the bladder has been for a long



time compressed between the foetal head and pubic arch ; catheterism is obviously the treatment.

Women who have previously had children are more or less troubled with "after-pains," the result of post-partum uterine contractions. To a certain extent these contractions are useful in promoting the expulsion of clots, shreds of decidua, etc., but when excessive they must be checked by the administration of opiates, otherwise they deprive the patient of sleep and weary her by their frequent recurrence, every fresh application of the child to the breast being sufficient to induce them by reflex action. Primiparæ are not troubled with after-pains, multiparæ suffer in direct ratio to the number of children they have borne.

Lactation occurs in the majority of women without much trouble ; in some, milk is present before delivery, in others it does not appear until after three or four days. The symptoms of incipient lactation are turgescence of the mammary vessels, shooting pains in the glands, accompanied with a sensation of tension, a slight rise of temperature, and in some cases an increased vascular action, shivering, furred tongue, anorexia, etc., due, I think, often to slight septic influences. On applying the child a peculiar yellow fluid called colostrum is obtained ; this "first milk" coagulates with heat, and under the microscope reveals the presence of granular corpuscles and free fat granules ; it acts aperiently on the child, and serves to clear out the infantile alimentary canal. After a day or two colostrum gives place to ordinary milk, which is not coagulable with heat ; the breasts then lose their sensitiveness and lactation is established. In some women there is great difficulty in inducing the milk to appear, and sometimes still greater in prevailing upon it to remain. Early but not too

frequent application of the child to the breast, hot fomentations, friction with stimulating liniments, etc., are the means usually adopted to promote lactation ; to these must be added a carefully regulated diet, and, later on, a fair amount of outdoor exercise. Sometimes the mammary secretion is greatly in excess of the infantile requirements, and the persistent overflow of milk causes much annoyance. In many cases this excessive secretion diminishes when the patient becomes able to move about ; if not, belladonna may be applied in the form of a plaster, the ingested fluids reduced to a minimum, and saline purgatives, like the following mixture, administered:—

R. Magnes. Sulphatis . . . . .	oz. 1
Mannæ . . . . .	oz. $\frac{1}{2}$
Acidi Sulphurici Diluti . . . . .	min. xx.
Sp. Chloroformi . . . . .	fl. oz. $\frac{1}{2}$
Vel Syrupi Zingiberis . . . . .	fl. oz. 1
Infusi Rosæ Co. ad. . . . .	fl. oz. viii.

An eighth, with an equal bulk of water, early every morning.

When the milk is tardy in making its appearance, the child may be temporarily fed with a few spoonfuls of cow's milk mixed with an equal quantity of water, to which a few grains of sugar have been added. As previously stated, the application of the child to the breast should not be too frequent until the flow of milk is established, twice or thrice a day being quite often enough to stimulate the glands into activity. When lactation is established the child should be accustomed, as much as possible, to take its nourishment at stated intervals, two or three hours being allowed to lapse between each application to the breast. It is injurious to both mother and child

to be constantly putting the infant to the breast in obedience to its every cry.

In *primiparæ* the nipples are occasionally so flat that the infant is unable to seize them and to draw the breast, hence various forms of exhausting glasses have been invented with a view to remedy this defect. They should be carefully used, otherwise excess of pressure may lead to inflammation of the *mammæ*. Sometimes another and older infant, with more tact in the art of satisfying its wants, is able to draw out the nipple, or the assistance of an adult may be put in requisition for this purpose.

One of the most painful of the minor mammary affections is excoriation of the nipples. This usually occurs in cases where the nipple projects insufficiently; the excoriations scab over during the intervals between suckling, but on reapplying the child the scab is torn off, and by degrees a simple excoriation is converted into the still more painful affection—fissure of the nipple. So acute is the pain that the mother frequently looks upon her maternal duty with the utmost dread, and the mental depression arising from this condition may eventually lead to suppression of the lacteal secretion. It is well to provide against the possibility of this evil by frequently bathing the nipples during pregnancy with brandy, spirits of wine, or a solution of tannin (1 in 20). In established excoriation and fissure the only effectual remedy, other than weaning the child, is to protect the nipple with a shield, so as to prevent direct contact with the child's lips, and give time for the sores to heal, which may be facilitated by keeping the nipple very clean and bathing it with a solution of borax and tannic acid, or painting it with a strong solution of nitrate of silver.

During lactation the breasts are liable to attacks

of acute inflammation, which not unfrequently result in the formation of that most painful and troublesome ailment known as mammary or milk abscess. This accident is most common during the first two months after delivery, though it may occur at any period of lactation, or even before delivery. Mr. Nunn, in a paper published in the *Obstetrical Journal* for 1862, states, as the result of his experience, that milk abscess occurs at the rate of 56 per cent during the first two months after parturition, at the rate of 14 per cent during the subsequent seven months, and rises to 29 per cent after the ninth month. The increased percentage after the ninth month is attributed by Mr. Nunn to a vitiated condition of the system induced by over-lactation. Mammary abscess may result from various causes; perhaps the most frequent is a fissured or ulcerated nipple, which, from the constant irritation produced by the act of suckling, causes inflammation and subsequent suppuration of the breast. Mechanical injuries, colds or surface chills, or over-distension of the lacteal ducts, caused either by blocking up of their orifices or by prolonged abstinence on the part of the infant, are also important factors.

*The Symptoms* commence with an acceleration of the pulse and a rise in temperature, the amount varying with the gravity of the case. If the mischief is considerable, the constitutional symptoms are very marked; a well-defined rigor usually announces the formation of a large or deep-seated abscess. The affected breast is tense and very painful to the touch; at first there is no change either in colour or contour, but in a little time a localised swelling appears, the skin immediately over it first blushes and then deepens in colour until the well-known glazed fiery hue is attained which indicates that pus is finding its

way to the surface. The whole gland, especially the site of the abscess, is now exquisitely painful, the least movement or touch being productive of the greatest agony; if allowed to take its course, the abscess in time bursts, and relief is at last obtained. Such is the progress of a single mammary abscess, but unfortunately this affection is apt to take on a multiple form, abscess after abscess forming, until in severe cases the whole organ is undermined in all directions, and the gland itself sloughs away leaving a number of fistulous openings, often exceedingly difficult to heal.

*The Treatment* of mammary abscess necessarily varies according to its stage of development. From the first it is generally necessary to withdraw the child from the affected breast, any attempt at suckling being attended with excessive pain. Fissures or excoriations should be promptly attended to in accordance with the methods previously described. The primary stage of inflammation should be combated by smearing the breast with extract of belladonna rendered fluid by the admixture of either water or glycerine, followed by the application of hot fomentations and poultices, simultaneously with which salines and bromide, or iodide of potassium, should be administered internally. By these means the tendency to lacteal secretion is checked, and resolution of the inflammatory products promoted. Should not this desirable result take place, the first decided manifestation of pus demands the use of either the aspirator or bistoury. If a free opening is made, the operation should be performed with the antiseptic precautions now usually adopted in surgical operations of this class. After evacuating the matter equable pressure by means of plasters and bandages should be maintained over the breast to promote closure of the

abscess. In the case of multiple abscesses the resultant sinuses, if slow to heal, should be laid open, and treated with carbolised oil, or other stimulating antiseptic applications. During the earlier stage, when the pain is great, relief must be afforded by the administration of morphia, either by the mouth or hypodermically. After suppuration is established, quinine and iron, with generous diet, including stimulants, are required to compensate for the systemic depression produced by the exhaustive effects of the purulent discharge and loss of rest.

The question of nursing is sometimes referred to the practitioner. Broadly speaking, every mother ought to nurse her child, or at least to provide a healthy and efficient substitute. Exceptions, however, are obliged to be made on behalf of those who, from constitutional or local causes, are unfit to perform the duties of nurse, and are at the same time unable to procure a substitute. Amongst the constitutional affections prohibiting nursing, I wish particularly to refer to chronic heart disease, there being little doubt that many patients thus afflicted are materially injured by being allowed to suckle their offspring. Dr. Angus Macdonald, in his elaborate treatise on chronic disease of the heart in pregnancy and childbed, states that in such cases suckling tends to keep up the cardiac hypertrophy and to increase the risks likely to arise from the defective heart. As a substitute for the breast, cow's milk diluted with one part of water to two of milk, and sweetened with common sugar, or sugar of milk, may be administered by the feeding-bottle. Preserved Swiss milk may be used in place of fresh milk. I take this opportunity of protesting against feeding-bottles furnished with a long snake-like tube, such as have lately come into fashion. They have two serious disadvantages—first, the tube, from

its inordinate length, cannot be properly cleaned, for the mere passage of hot water through it is insufficient to free it from the decomposing taint which contact with milk leaves behind ; and secondly, it facilitates the obnoxious plan adopted by many nurses of placing the teat in the child's mouth, and allowing it to remain until the contents of the bottle are exhausted ; this may not take place for several hours, and in the meantime the milk is rapidly approaching the condition of lactic acid, and as a consequence the child is ill nourished, and is perpetually troubled with the symptoms of indigestion. The old-fashioned form of feeding-bottle obviates both these defects, as there is nothing to clean except the bottle and teat, the teat being readily turned inside out for thorough purification, and the shape of the bottle renders it necessary for the nurse to hold it whilst the child is feeding, thus guaranteeing the supply of food only when required. After each feeding the bottle should be immediately placed in cold water, and before being used again it should be scalded out, the teat being treated in the same way.

When the services of a wet-nurse are deemed requisite, the choice usually devolves upon the medical attendant ; in making the selection attention should be paid to the general health both of the candidate and of her offspring. The nurse should be between twenty and thirty years of age, well developed, good tempered, and free from cachectic taint. The breasts should be plump and firm, giving evidence of a good supply of milk, which on microscopic examination should reveal abundance of milk granules ; the nipples prominent, and free from fissures or excoriations. The condition of the teeth, tonsils, cervical glands, skin, and hair, should be investigated, to guard against the selection of a scrofulous or syphilitic subject. The

nurse's child should be examined as to the state of the anus, skin, and nasal cavities, and also as to its general condition. The age of the infant should be nearly the same as that of the child about to take its place. The diet of a wet-nurse should consist of plain nourishing food, avoiding over-feeding either in quantity or quality. It must be remembered that the rank of life occupied by women who usually fulfil this duty has not accustomed them to rich and varied food, and consequently that a sudden change in the character of their food is apt to disorder the digestive organs and consequently to impair the quality of their milk. For the same reason it is well to see that the customary potations of beer and stout are not excessive. A regular system of out-door exercise is also obviously necessary for the maintenance of health.



## CHAPTER XIX.

## OBSTRUCTED LABOUR (MATERNAL ORGANISM).

DEFORMITY of the maternal pelvis, the anatomical varieties of which have been previously described, is a frequent cause of obstructed labour. When the conjugate diameter exceeds  $3\frac{1}{4}$  inches, delivery may be effected with the forceps; when it is reduced to 3 inches, version is feasible; under this measurement, and down to  $1\frac{3}{4}$  inch, craniotomy becomes necessary; and with a diameter less than this the Cæsarian section is the only resource. If the malformation is detected in the early months of pregnancy, the question of inducing premature labour will have to be considered. The rules to guide us relative to the necessity of performing this operation will be found in the section on Operative Midwifery.

The soft structures which enter into the formation of the parturient canal are liable to certain abnormalities.

*Uterus.*—The os may be partially or totally occluded. Total occlusion is a rare incident, since it must take place during gestation, which otherwise could not occur. The usual form of occlusion of the os consists in a superficial agglutination of its lips, which may be overcome by forcible pressure of the finger-nail during a pain, aided, if there is much resistance, by giving a rotary movement to the finger. Once the os is permeable, dilatation proceeds in the

ordinary manner. In very rare cases a more permanent kind of union takes place, resulting from either inflammation of the cervix or injudicious cauterisation of the canal. This form requires the assistance of the knife, and the incision should be carefully made in the antero-posterior direction to avoid the uterine arteries, care being taken also not to injure the bladder or rectum. Severe malignant disease of the cervix may require similar treatment. In a case of this kind which occurred in the practice of Dr. Godson, delivery at term was effected by dilatation by Barnes' bags, turning, and perforation of the occiput, with cephalotripsy. Cases have occurred of adhesion between the foetal membranes and the internal surface of the uterus in the neighbourhood of the os. The treatment is forcibly to separate the adhesions with the finger.

Rigidity of the os uteri is an important factor in the causation of obstructed labour; it varies from a mere inaptitude to dilate, to a cartilaginous and obstructive degree of induration. The treatment, as a matter of course, must vary with the degree of rigidity. General depletion and tartar emetic were formerly the trusted remedies, but other less debilitating and disagreeable means are now usually preferred. Chloral hydrate in 15-grain doses, repeated every quarter of an hour two or three times until it takes effect, is a very valuable remedy. Chloroform also, by relaxing spasm and lulling pain, is of great service. Belladonna used to be a favourite local application, but its action is very doubtful. The two most effectual applications are irrigation and hydrostatic dilatation. Irrigation is performed by passing the vagina tube of a Higginson's syringe up to, but not into the os, and douching it with warm water for ten minutes at a time, repeating the operation at

intervals until the os becomes soft and dilatable. Hydrostatic dilatation is effected by introducing within the os, with the aid of a uterine sound, one of those valuable little india-rubber bags invented by Dr. Barnes, and then injecting water into it through the tube attached to it, a constriction in the middle of the bag preventing it from slipping out of the os. When one bag has been fully distended it is

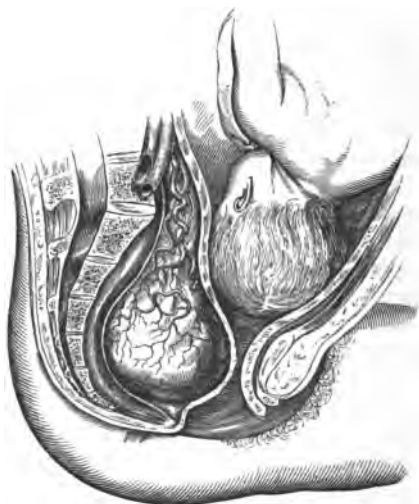


Fig. 87.—LABOUR IMPEDED BY OVARIAN TUMOUR.

withdrawn by letting the water escape, which causes the bag to collapse; then, should further dilatation be needful, a larger bag is introduced and the operation repeated. By this means dilatation of the os is effected in imitation of the ordinary process, for the rubber bag with its aqueous contents acts in precisely the same way as the natural "bag of waters."

In some cases where the rigidity is not excessive much help may be given by manual dilatation, which is effected by passing the thumb and two or three fingers within the os, and spreading them out in the form of a cone. This expedient, however, will succeed only in slight cases, for the hand rapidly becomes cramped and unable to continue its action.

A fibrous tumour pendent from the uterus, a



Fig. 88.—CANCEROUS GROWTHS FROM THE BONES OF THE PELVIS, CAUSING DEFORMITY.

cancerous growth from the pelvis, or a solid ovarian tumour, are occasionally the cause of obstruction to delivery. At an early stage of labour the tumour may be passed up above the brim, unless the head is in the pelvic cavity and the tumour below it, in which case the forceps or craniotomy will be

required. Dr. Wallace of Liverpool reports a case in which labour was arrested by a fibroid projecting from the cervix and lower segment of the uterus into the pelvic cavity, and as the tumour could not be passed up above the brim, it was enucleated, and delivery effected by the long forceps; the fibroid weighed fourteen ounces. A second tumour was discovered higher up in the uterus, but as it did not interfere with labour it was allowed to remain, and on examination, after an interval of two months, it was found to have disappeared by absorption. In the case of a fluid ovarian tumour, the passage of a trocar will perhaps reduce the obstruction sufficiently to permit of delivery. Uterine polypi should be either punctured or removed with the forceps or *écraseur*. A case of uterine polypus is reported by Dr. Gervis in vol. xi. *Obstetrical Transactions*, producing obstruction so great as to necessitate the performance of craniotomy.

*Vagina*.—Constriction resulting from inflammation, cicatrices produced by the healing of wounds caused by previous instrumental or tedious deliveries, etc., should be treated by inhalation of chloroform, artificial dilatation with air or water bags, or, in the case of cartilaginous bands, careful incision.

*Vulva*.—Obstinate rigidity is best treated by making several small incisions at the posterior part. Serous infiltration should be allowed to escape by puncturing with the point of a lancet. Hæmorrhagic infiltration, or thrombus of the labia, may be checked by the application of cold, but if, notwithstanding, the swelling still increases and is likely to burst, it is better to lay it open with the knife and apply styptics.

*Hymen*.—A persistent condition of this membrane has ere now impeded delivery; if it will not give way, the knife must be resorted to.

*Vesical calculus* may obstruct labour. If found early the stone should be lifted above the pubis ; but if this cannot be done and delivery is prevented, rapid dilatation of the urethra and extraction of the stone, or vaginal lithotomy, must be performed.

*Fœtal Organism.*—The presence of certain diseases and abnormalities in the foetus will, even in a healthy



Fig. 89.—LABOUR IMPEDED BY HYDROCEPHALUS.

maternal organism, produce dystocia, and apart from mal-development of the foetus, it is obvious that the undue size of a child of normal type may occasion more or less delay in parturition, and may require treatment identical with that necessary when the disproportion arises from contraction of the maternal pelvis.

The most important cause of obstructed labour on the part of the foetus is hydrocephalus. Sometimes the foetal head is immensely enlarged; and although its contents are mainly fluid, rendering the head capable of being moulded to a considerable extent, still the obstruction to delivery is usually so great as to require the intervention of art. This is accounted for by Dr. Tyler Smith on the ground that the head, by reason of its abnormal shape, does not undergo the necessary rotation, etc., in its passage along the parturient canal, and therefore has to be expelled by sheer force. In cases of hydrocephalus pelvic presentations are more frequent than with healthy children.

*Diagnosis.*—When the head presents, it gives to the fingers, especially during a pain, the sensation of a bag containing fluid; moreover, the wide separation and irregular projection of the cranial bones lead also to a suspicion of hydrocephalus. In pelvic presentations the diagnosis is more difficult, and indeed can hardly be established until the head becomes arrested in the pelvis.



Fig. 90.

BLUNT  
HOOK.

*Treatment.*—If the diagnosis is certain, and the uterus is unable to expel the foetus, the proper plan is to puncture the head and cause it to collapse from liberation of the fluid. Then, if the head is not too low, it is advisable to bring down the feet, as the flaccid cranium, by not participating in the necessary movements, hinders expulsion. If the head is advanced too far for version to be easily performed, the case must be left to the efforts of nature. In pelvic presentation, perforation, when necessary, should be done through one of the spaces between the cranial bones. Ascites

and distension of the foetal bladder with urine, must be treated in a similar way, the fluid when it interferes with the course of labour being evacuated with a long trocar. Dr. Gervis reports a case where obstruction was caused by the uterus of the child being greatly distended, containing about fifteen ounces of



Fig. 91.—FŒTAL MONSTROSITY.  
(After Hall.)

flaky serous fluid. Solid tumours, such as enlargement of the liver or kidneys, may on like grounds necessitate the performance of embryotomy.

*Monsters.*—An anencephalous foetus, when the head presents, is best delivered by podalic version, as the trunk is generally pretty well developed, and the



undilated parturient canal affords considerable resistance to its passage. If version is not performed, the blunt hook will most likely be required.



Fig. 92.—DOUBLE FETAL MONSTROSITY, UNITED AT THE LOWER END OF EACH TRUNK. (After White.) From a drawing presented to me by my friend Mr. Thomas Windsor.

Extra-cranial and spinal dropsy, forming spina bifida, does not usually much impede parturition ; in cases of the former class the head and tumour are usually born separately by a species of evolution.

In monstrosity caused by the union of two ova no rule can be laid down either for diagnosis or extrac-

tion, inasmuch as cases differ so greatly in degree and kind. In cephalic presentation evolution usually takes place, one of the heads being expelled whilst the other is retained above the pubis; the trunk



Fig. 93.—TWINS.

belonging to the first head follows, and then the second foetus is born breech first. In other cases the heads are successively born, and the trunks follow. If labour is brought to a standstill, it may be necessary to perform embryotomy.

In ordinary twin births the presentation is usually alternate, that is, if the first is cephalic the second will be breech. As a rule no more difficulty is en-

countered in expulsion than may be naturally expected from the force of the womb, whilst extruding the first child, being transmitted indirectly through the second foetus, a condition much less favourable to speedy delivery than the usual direct uterine action.



Fig. 94.—LOCKED TWINS.

In some instances when the first child presents by the breech, the head of the second enters the pelvis before the first is born, and the two heads become locked together: in this case we may endeavour to extract the head of the *second* child with the forceps, and if this cannot be done the head of the first child (whose trunk is already born) must be perforated and ex-

tracted, or it must be severed from the trunk and pushed back whilst the second foetus is extracted with the forceps, after which the forceps or cephalotribe is introduced to bring away the severed head. When the heads of both children present, the forceps should be applied to the lowest, the other being pushed out of the way as much as possible during extraction.

## CHAPTER XX.

## PROTRACTED AND HASTY PARTURITION.

HAVING considered mechanical obstructions in the maternal and foetal organisms in hindering parturition, we will now discuss the cause and treatment of retardation, dependent solely upon insufficiency or misdirection of the expulsatory powers.

Feebleness of uterine action, commonly called powerless labour, may result from causes affecting either the general system, or from causes localised in the uterus itself. In a feeble and relaxed condition of the system, it is easy to comprehend that the uterus will participate in the general want of tonicity, and that the assistance usually rendered by the voluntary muscles will, *pari passu*, be diminished. The sedentary and luxurious way of life of women dwelling in large towns too often leads to this enervated condition. When a patient has been in hard labour for some time without advancing towards delivery, the rhythmical action of the uterus gives way to one of continuous contraction. Dr. Braxton Hicks, in calling attention to this subject, shows that such a state is frequently mistaken for powerless labour, it being supposed that the uterus is inactive and relaxed. If this condition of continuous contraction is allowed to go on without interference, the genital canal becomes hot, dry, and tumid, the pulse rises to about 100, the tongue becomes furred and dry, and if

relief is not quickly at hand the symptoms will assume a typhoid form, and the patient will die. There is also much risk to the child in the earlier stage of continuous uterine contraction, partly from the sustained pressure and partly from the diminution of the calibre of the uterine blood-vessels depriving the foetus of its due supply of blood. Continuous contraction may be diagnosed by the uterus being so closely in contact with the child as to assume its shape, percussion showing, when the foetal outline is passed, an immediate cessation of dulness, instead of its continuing some distance, as is the case in relaxed uterus; the head, moreover, is fixed in the pelvic brim, and cannot be easily moved. This condition rarely ends in natural delivery, the forceps being usually required.

Certain diseases, as bronchitis and other pneumonic affections, cardiac disease, and paraplegia, by interfering with the action of the respiratory muscles, may deprive the uterus of its due mechanical assistance, and consequently retard delivery. Painful pre-existing disease, by withdrawing nerve force from the uterus, will considerably modify its action. Dr. Angus Macdonald, in the work previously quoted, states that the presence of cardiac disease ought always to lead us to lessen, as far as possible, the effects of the bearing-down efforts either by the timely application of the forceps, or the performance of version, especially if the second stage of labour is prolonged.

Amongst the purely uterine causes of tedious labour are malformations, as double uterus, congenital imperfection in development, inflammation, over-distension through excess of liquor amnii, or the presence of twins, and premature or retarded rupture of the membranes. The age of the patient—excessive youth

or the converse—and rapidly recurring pregnancies, by interfering with the efficient development of the organ, tend to enfeeble the expulsatory power.

Temporary suspension of uterine action may be produced by mental causes, as the presence of a strange accoucheur, or the reception of unwelcome news.

Misdirection of the expulsatory force is another cause of tedious labour. If the uterus is anteverted the child is driven against the promontory of the sacrum, the anterior uterine lip occupying the position normally occupied by the os, and thus helping to prevent a downward movement of the child. If the organ is retroverted the child is forced against the symphysis pubis, and the passage is blocked by the posterior uterine lip. Accumulation of fæces in the rectum, or of urine in the bladder, tends to impede uterine action.

*Treatment.*—Many of the causes of tedious labour can only be treated prophylactically ; when, therefore, the opportunity for giving advice presents itself, we should urge upon a patient the necessity of regulating her mode of life, of taking a due amount of exercise, being careful in the matter of diet, and attending to the daily evacuation of the bowels. Any tendency to obliquity of the uterus existing during pregnancy must be rectified as much as possible by bandages and the adoption of certain positions of the body. In anteversion an abdominal bandage so arranged as to lift up the uterus into a position more in accordance with the axis of the pelvic inlet, and the assumption of the prone position are indicated ; in the case of retroversion all conditions which lead to this misplacement, as tight lacing and bandages, should be avoided. These remarks apply equally to the pregnant and parturient states, with this addition, that in

retroversion the patient should be delivered on her hands and knees, so as to bring the os away from the pubic symphysis, and to allow the anterior uterine lip to retract, while in anteversion the woman should lie on her back, to enable the child to escape the promontory of the sacrum, and the anterior uterine lip to ascend to its proper position; in furtherance of this object the fingers may be used between the pains to push up the protruding lip.

Feeble action of the uterus in the second stage may be improved by encouraging the patient to bear down during the pains, and to rest during the intervals, since persistence of the expulsive efforts between the pains serves only to fatigue the voluntary muscles. The uterus may be also excited to more vigorous action by the occasional introduction of the finger within the os, and by pressure on the perineum and abdomen. Of the medicinal exciters of uterine action ergot and perhaps strychnia are alone to be relied on. Ergot may be given in the form of powder or as a liquid extract. One or two scruples of the powder infused in hot water for five or ten minutes form a dose; the fluid preparation may be administered in warm tea, the dose being a fluid drachm.

The action of ergot usually becomes manifest in from ten to fifteen minutes; the pains increase in severity and duration, the uterine action gradually merging into a condition peculiar to the influence of this drug, that is, becoming continuous instead of intermittent. It will then be found, by placing the hand on the abdomen, that the uterus, between the pains, is in a state of tonic contraction. This state, inasmuch as it impedes the placental circulation, and thus interferes with the due supply of oxygen, is a cause of danger to the child, and if long exposed to this influence it will die asphyxiated. The mother



may also be placed in jeopardy through the continuous violent action induced by ergot, for, should there be any mechanical impediment to delivery, the persistent and misapplied force of the uterus is liable to produce laceration of the soft parts, or even to rupture itself. Therefore *never* give ergot without ascertaining that there is no mechanical impediment to immediate delivery.

The coexistence of a painful disease with parturition, or the violent pain produced by pressure of the head on the sacral nerves, may be mitigated by a few whiffs of chloroform. The same drug, too, is sometimes required for a hysterical or hyper-excitable patient who rapidly exhausts her strength by ill-timed exertions.

In a tedious labour, when the vaginal secretions are arrested and the canal becomes hot, dry, and painful, much relief is sometimes afforded by the plentiful lubrication of the passage with lard. Fæcal accumulation or distension of the bladder should be respectively removed by enemata and the catheter. Irregular spasmodic contraction of the uterus, especially during the first stage, is best treated by the administration of opiates or chloral; the chloral is very comforting to the patient, as it soothes the nervous excitability whilst it permits the uterus to perform its office.

#### HASTY LABOUR.

This may be defined as the converse of the previous condition, the child being expelled in a preternaturally brief time after the commencement of labour. The causes are twofold—excess of power and diminution of resistance. So excessive sometimes are the uterine contractions that they resemble those

produced by ergot, the whole function of parturition being performed with surprising celerity under pressure of a rapidly accumulating series of pains. This impetuous uterine action may be idiocratic, some individuals, or even whole families, invariably performing the final act of gestation with undue haste. It may be induced also by violent mental emotion, especially sudden and intense terror. Smallpox, and other febrile diseases, albuminuria, and the accumulation of carbonic acid in the blood, tend also to a like result.

The second cause—lack of normal resistance—may result either from excess of pelvic development or, what amounts in effect to the same thing, small bulk of the fœtus.

Amongst the evils to the mother which may result from too rapid delivery, are rupture, prolapse, or inversion of the uterus, laceration of the perineum, post-partum inertia, and irregular uterine contraction, causing retention of the placenta or hæmorrhage.

The child also is liable to injury, especially if the mother, not suspecting so rapid a termination to her sufferings, happens to be standing when expulsion takes place.

*Treatment.*—When this condition is suspected, the patient should be kept in bed, and given chloroform or opiates. Care should be taken not to irritate the uterus by frequent examinations, and the patient should be cautioned against making much voluntary effort. A moderately tight bandage round the abdomen is serviceable. Should the uterus become prolapsed, it must be supported by a bandage or the hand of the accoucheur.

*Missed labour* is a term applied to an exceedingly rare class of cases where labour fails to take place at the end of gestation, the fœtus remaining in

utero for an indefinite period. After a time disorganisation may take place, and portions of the foetus be discharged per vaginam. When this happens it is well to assist the uterus to get rid of its lingering contents by endeavouring to break up the foetus and bring it away piecemeal. A unique case of missed labour, reported by Dr. Oldham, will be found in the *Path. Soc. Trans.* for 1841.



Fig. 95.—CONTENTS OF CYST, IN DR. OLDHAM'S CASE OF MISSED LABOUR.

## CHAPTER XXI.

## ACCIDENTAL HÆMORRHAGE.

ONE form of hæmorrhage during labour has been described under the head of placental presentation ; another, known in England as *accidental hæmorrhage*, now claims attention. The term "accidental" was given to this form of hæmorrhage by Dr. Rigby in contradistinction to that produced by placenta prævia, which he called "unavoidable hæmorrhage."

In the form of hæmorrhage under notice the placenta is normally situated, but from deficient attachment a portion becomes separated from the uterine wall and thus affords a means of escape to the blood. If the detachment takes place at the circumference of the placenta, the blood will find its way between the uterine wall and membranes and appear externally. Accidental hæmorrhage is distinguished from the hæmorrhage of placenta prævia by ceasing instead of increasing with each pain, in consequence of the source of hæmorrhage being above the fœtal head ; for when, during a pain, the cranium is forced against the os uteri, the uterus is plugged and the blood is unable to escape. Sometimes the detachment occurs at the centre of the placenta, all the circumferential implantation remaining intact, in which case we have the symptoms of internal hæmorrhage, pallor, faintness, sinking of the pulse, together with severe abdominal pain and an irregular bulging of the uterus

perceptible through the abdominal walls, the bulging part being painful to the touch. This variety is somewhat difficult to diagnose; it may be distinguished from rupture of the uterus by the previous absence of violent uterine contractions, by the increased bulk of the uterus, and by want of mobility of the presenting part which is so characteristic of rupture.

The prognosis is unfavourable for the child, and gravely riskful for the mother.

The contents of the uterus should be evacuated as speedily as possible, by rupturing the membranes, friction on the abdomen, ergot, etc.; if the os is not dilated, Barnes' bags may be used, and delivery completed by version or by the forceps. As there is always considerable risk of post-partum hæmorrhage supervening from atony of the muscular coats of the uterus, dilatation should be done cautiously and without haste, endeavouring meanwhile to induce the uterus to contract upon and aid in the expulsion of the foetus.

*Post-partum hæmorrhage.*—This, like placenta prævia, is a most serious complication, and demands all the energy, self-reliance, and resources of the practitioner to be brought into immediate play, with a predetermined and definite plan of treatment. Hæmorrhage may occur either before or after expulsion of the placenta. In order to understand the various modes of treatment which are required in hæmorrhage after labour, it is necessary to bear in mind that retention of the placenta may be due—1st, to atony of the muscular coat of the uterus; 2d, to irregular contraction; and 3d, to morbid adhesion between the placenta and uterine walls.

Inertia of the uterus may be caused either by general debility of the system or by special atony of

the uterine muscular fibres ; in either case an attempt must be made to excite contraction by external manipulation, and the internal administration of ergot and stimulants. When hæmorrhage is actually taking place, no time should be lost in extracting the placenta, certain then to be detached, for its presence prevents efficient uterine contraction. Much may be done to prevent imperfect post-partum contraction of the uterus by placing the hand on the fundus during expulsion of the child, and following its downward movement until it comes into the world. If there is any reason to suspect uterine inertia arising from speedy delivery, or a long and tedious labour, or the existence of Bright's disease, or the occurrence of floodings after previous labours, it is advisable to administer ergot during the final expulsive stage. Spasmodic and irregular contraction of the uterine muscular fibres may occur in such a manner as to encyst and imprison instead of expelling the placenta. When the contraction exists at the internal os, "hourglass contraction" results, the uterus being divided into two compartments with the placenta in the upper division ; true hourglass contraction is, however, of rare occurrence. The treatment consists in mechanically overcoming the spasm in the following manner :—The cord is taken in the left hand, and the right hand is passed along it, with the tips of the fingers brought together so as to present the appearance of a wedge or cone, until it reaches the constriction, when the left hand should



Fig. 96.  
HOURGLASS CONTRACTION.

be transferred to the fundus uteri, so as to steady the womb and make the necessary pressure, whilst the right is gently and very gradually insinuated beyond the contraction; the placenta is then grasped, and the uterine contractions aided by external pressure, so as to expel both hand and placenta.

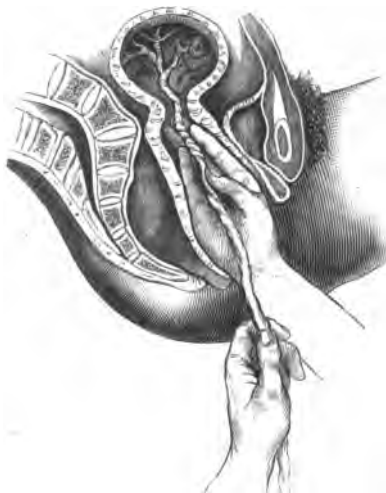


Fig. 97.—EXTRACTION OF ENCYSTED PLACENTA.

Retention of the placenta due to morbid adhesion is generally a sequence of previous inflammatory action; plastic lymph has been effused, and the placenta and uterus become so firmly united that the post-partum contractions are inadequate to dislodge the after-birth; the hand must therefore be passed into the uterus in the way before described, and the placenta carefully and very cautiously peeled off the uterine parietes, so as to avoid both injuring the uterus and leaving any portion of the adherent placenta. When

the placenta is very friable, or the adhesions are firm, it is no easy matter to bring all away without using undue violence. In this choice of evils it is better to do too little than too much, although it must be remembered that a small portion of retained placenta will occasionally cause copious hæmorrhage. If there is any suspicion that a portion is left, it is well to wash out the uterus at intervals with water coloured with a small portion of Condyl's fluid, so as to oxidise the decomposing particles, and thus diminish the risk of septic poisoning.

*Inversion of the uterus* is fortunately a rare cause of



Fig. 98.—COMMENCING INVERSION OF THE UTERUS.  
(From a preparation in the Museum of Guy's Hospital.)

hæmorrhage. Inversion may be partial or complete, varying from a cup-like depression of the fundus to complete protrusion of the inverted organ through the



vulva. It is said to be partial when the fundus remains above the os, and complete when it protrudes into the vagina or through the vulva. Inversion may be caused by a sudden tug at the cord, as when delivery takes place in the erect position, and the child is suddenly expelled and falls to the ground; by injudicious traction at the cord under certain conditions, as when the uterus is in a state of inertia, or when a slight degree of inversion of the fundus already exists; and in rare instances by pressure of the abdominal muscles. When the placenta remains completely attached there may be no immediate hæmorrhage; but as the relative changes in position which take place between the placental and uterine surfaces in the act of inversion usually detach it more or less, the hæmorrhage then becomes very copious.

The *Symptoms* vary according to the degree of inversion; dragging pains, restlessness, failing of the pulse and consequent syncope, nausea, cold sweats, ghastly pallor, and the usual indications of shock and collapse, are more or less manifest.

*Physical signs.*—If the inversion is slight, the depression in the fundus may be felt through the abdominal wall; when it is complete the uterus cannot be felt above the pubes, but is found in the vagina, or perhaps protruding through the vulva, like a bright red tumour. After a time, the constriction of the cervix causes the organ to assume a deeper colour and to become tumefied, a condition which greatly increases the difficulty of replacement.

*Treatment.*—In a uterus recently inverted with the placenta still attached, the first step is carefully to remove the placenta; the uterus, if inert, should then be compressed with the hand so as to empty its vessels, and pressure applied with the closed fist in the axis of the pelvis, taking care to avoid the sacral

promontory, which is best done by applying the pressure slightly in a lateral direction, when, if recently inverted, the organ usually returns to its normal position; the hand should be retained in the uterus, and the organ grasped externally through the abdominal wall until it thoroughly contracts, lest re-inversion take place. If the operation is attended with any difficulty or excessive pain, chloroform should be administered. In inversion of some standing it is necessary first to reduce any inflammatory symptoms by hot fomentations, leeches, etc., then to devise some contrivance with air-pessaries, or other means, so as to keep up sustained pressure for a considerable time. When the inversion has become chronic, that is, as defined by Dr. Barnes, after involution has taken place, sustained pressure or the taxis should be tried; the length of time and the degree of force used must be left to the judgment and experience of the operator. A high authority, Marion Sims, limits the duration of the taxis to half an hour, and recommends the introduction of an air-pessary, to remain until the patient has rallied from the effects of the operation, when a second manipulation may be attempted; and this failing, the operation proposed by Dr. Barnes may be resorted to, of making two longitudinal incisions into the constricted os, and then reapplying elastic pressure. If these means fail, excision must be resorted to.

*Post-partum hæmorrhage.*—When, after extrusion of the placenta, hæmorrhage supervenes, it is principally the result of uterine inertia; contraction may have duly taken place, but from some cause or other the muscular coats of the uterus lose their contractility, and the organ is metamorphosed from a compact hard ball into a loose flabby bag, leading to the reopening of the mouths of the uterine vessels, and to the outpouring of blood with a copiousness to be expected

from canals of such large calibre having direct communication with the cardiac centre. Hæmorrhage may manifest itself at once by the blood flowing from the vulva; but if the uterus is retroverted, or if a clot blocks the os, the blood may collect in and distend the uterus, little, if any, escaping externally—an accident manifested by the patient becoming pallid and faint, and by the increased size and soft and quaggy condition of the uterus. If the blood escapes without accumulating, the uterus will be scarcely perceptible through the abdominal walls, having lost all its solidity and become flaccid as an india-rubber bag. If, as is frequently the case, the flow of blood is rapid, the patient is brought to the brink of the grave in a very few minutes, through the appalling quantity of blood lost, the sufferer becoming suddenly blanched, and presenting a singularly corpse-like appearance; she calls for help, and wildly tosses about her arms; vision and hearing fail, and she gasps for more air; the surface becomes cold and the pulse fails to reach the wrist; in a few minutes more, her strength exhausted, she wishes to be left to die in peace, which consummation will quickly come to pass unless energetic steps are taken to prevent the extinction of, literally, the “vital spark.”

The first step is to place the patient on her back, with her head low, and to grasp the uterus through the abdominal wall, so as to induce it to contract; an intermittent compressing movement of the hands will often succeed when uniform pressure fails; if the uterus fails to answer, the right hand should be carefully introduced into the organ, and any clots removed. A combined external and internal manipulation must now be judiciously practised; the stimulus afforded by the hand in the uterus generally evokes contraction, and if it does the hand must be kept there until the uterine contractions expel it.

The administration of stimulants is of the utmost importance ; brandy is, perhaps, the best, and should be given freely. The subcutaneous injection of ether has been found to act as a powerful stimulant in cases of hæmorrhage. Dr. Macan reports a case in which the injection of 45 minims of ether into the cellular tissue of the abdominal walls was productive of most beneficial results. It is necessary to pass the needle of the hypodermic syringe well down into the subcutaneous cellular tissue, otherwise abscesses may form at the seat of puncture. Ergot is usually resorted to, but too much confidence must not be placed in this drug, as, to say the least, its action is uncertain ; it may be administered by the mouth ; or a solution of ergotine (5 to 10 grains) may be injected hypodermically, a preferable mode, perhaps, as its effect is more immediate. The external application of cold by the cold water douche, or by flapping wet cloths over the abdomen, is of great service in setting up uterine activity by reflex action ; internally, too, cold water may be injected into the rectum or uterus itself, or pieces of ice may be introduced into the womb ; but it must be remembered, that as cold induces reflex action by the sudden abstraction of heat, thus causing nervous excitation, a continuous application of cold, after a time, ceases to be beneficial, for the part loses so much heat that the difference in temperature between it and the cold-producing agent is insufficient to evoke further contraction. Moreover, the continuous application of cold depresses the system greatly, and tends to produce congestion of the internal organs. The introduction of ice into the uterus should not be continued too long, lest the muscular fibres become too benumbed to be able to obey the behests of the motor nerves, cold therefore should be applied intermittently. In Faradization we

have a very valuable excitant of uterine contraction ; one electrode being applied to the cervix and the other to the abdominal walls immediately over the fundus uteri. Dr. Lombe Atthill relates two interesting cases in which the injection of hot water into the uterus induced immediate uterine contraction and stoppage of the hæmorrhage. Dr. Atthill considers this treatment specially applicable to cases of hæmorrhage in patients debilitated by previous disease, or worn out by frequent, though it may be small, losses of blood, and, *pari passu*, it is in such cases that the application of cold is useless and often injurious. In cases of this description the hæmorrhage usually takes the form of a small stream of blood which continuously trickles from the vulva, and which neither pressure nor cold will check. Dr. Atthill's treatment is to pass the tube of a syringe within the uterus up to the fundus, and to inject water at about 110° Fahr. In the cases alluded to the result was very satisfactory ; the uterus contracted, the hæmorrhage ceased, and the patient quickly rallied. In following this method of treatment two conditions must be observed—the temperature of the water must not be much below 110°, and the tube of the syringe must be carried close up to the fundus uteri.

In desperate cases compression of the abdominal aorta may prove useful ; although it can only reduce and not arrest the flow of blood into the uterus, still any means of gaining time is invaluable. Pressure may be applied through either the posterior wall of the uterus or through the abdominal wall. If through the abdominal wall the thighs should be flexed on the trunk to relax the muscles of the belly, and pressure applied should be near the umbilicus so as to compress the aorta against the left side of the vertebral column, and thus to avoid the vena cava.

All the foregoing plans, with the exception of pressure on the aorta, tend to check hæmorrhage by producing reflex action; if, however, the uterus, either through excessive loss of blood, or a total want of contractile power in itself, remains absolutely and persistently passive, it is obvious that remedies of this class are unavailing. There is yet another means which, by acting directly on the internal surface of the uterus, is independent of nervous or muscular power—I allude to the injection of astringent solutions into the cavity of the uterus. For this purpose several substances have been used, but the most efficacious, and the one now generally adopted, is a solution of perchloride of iron, a salt long known as a powerful styptic, causing instant coagulation of the blood, and corrugating mucous or other secreting surfaces.

The form recommended by Dr. Barnes, who first in this country introduced this means of checking uterine hæmorrhage, is 4 oz. of liquor ferri perchloridi fortior with 12 oz. of water, to be slowly injected into the uterus by means of a Higginson's syringe with long uterine tube, taking care to avoid the introduction of air by carefully filling the whole of the injecting apparatus with the fluid previous to commencing the operation. The effect produced is immediate coagulation of the blood in the uterus, the formation of clots or thrombi in the openings of the uterine vessels, and a general corrugation of the internal surface of the organ, with the production, in some cases, of more or less muscular action, the sum of these effects resulting in speedy suppression of the hæmorrhage. Unfortunately certain ill effects are liable to occur; the principal fear is lest a clot of coagulated blood be carried into the circulation and reach the heart, or be arrested in some of the important

vessels, producing in either case serious results. There is also the risk of some of the fluid finding its way through the Fallopian tubes into the abdominal cavity and producing virulent peritonitis. Dr. Barnes very fairly and openly discusses these objections, and cites certain fatal cases due to this practice. He grounds his defence of the iron injection, on the urgency of the cases leaving no choice between death from hæmorrhage, on the one hand, and on the other the possible occurrence of the above-named mischances. The deduction to be drawn is, that when other means fail, it becomes our duty to resort to a method of treatment which, though avowedly not free from risk, yet affords the sole chance of preserving life.

*Transfusion.*—When a patient is dying solely from loss of blood, it is obvious that if a fresh supply can be thrown into the system, the fatal result may be warded off and time gained for recovery. The operation may be performed in two ways: immediately by placing a direct channel of communication between the blood-giver and blood-receiver, or mediately by receiving the blood into an open vessel, and thence transferring it to the patient.

For immediate transfusion Dr. Aveling's instrument is simple and efficacious; it consists of an india-rubber tube furnished at each end with a small silver canula, and having in its centre a bulbous swelling unfurnished with valves, the fingers of the operator supplying their place. When blood cannot be obtained, it has been proposed to use a saline solution, as Dr. Little's, mentioned below, adding 2 drachms of alcohol to each pint; a much larger quantity (60 to 80 ounces) of this solution is required than when blood is used. If this solution cannot be obtained, water rendered alkaline by ammonia or carbonate of soda may be substituted. The instru-

ment is first carefully filled with a warm (98°) saline solution. Dr. Little's formula is as follows:—

Chloride of sodium	.	.	60 grains.
Chloride of potassium	.	.	6 "
Phosphate of soda	.	.	3 "
Carbonate of soda	.	.	20 "
Distilled water	.	.	20 ounces.

A vein is then opened in the blood-giver's arm, into which one end of the apparatus is inserted; a vein is also opened in the blood-receiver's arm, which, owing to the bloodless condition of her body, is frequently a matter of some difficulty. Her vein should first be carefully dissected out and a probe passed under it before making the opening, which should be parallel to the course of the vessel; the other end of the apparatus should then be passed into the opening and held secure. This done, the tube is pinched between the finger and thumb on the blood-giver's side of the central bulb, which is *slowly* compressed so as to force the contents into the blood-receiver's arm. When this is done the tube is pinched on the blood-receiver's side of the bulb, the fingers being removed from the opposite side, so that the central bulb in expanding solicits blood from the blood-giver's arm; these manœuvres are repeated until sufficient blood, about 6 or 8 ounces, is transfused.

Another ingenious apparatus for immediate transfusion is that of Dr. Roussel of Geneva. This instrument, like that of Dr. Aveling, consists of a caoutchouc tube, with a bulbous swelling in the centre. At one end is a canula of hard caoutchouc for insertion into the vein of the blood-receiver; the other end is attached to a cylinder open at both ends, which is surrounded by a cupping-cup. The bottom of the cylinder and that of the cup are on the same



plane, so that when the cup is placed on the blood-giver's arm, and the space between the cylinder and the cup is exhausted of air (which is accomplished by means of a caoutchouc exhausting-syringe attached to the instrument), the cup, from atmospheric pressure, adheres to the surface and presses the open end of the cylinder over the vein. The upper end of the cylinder is closed by a mounted lancet, which can be adjusted so as to penetrate to any required depth. By means of an aspirator with which the instrument is provided, the entire apparatus—except the cupping-cup—can be filled with water, so as to exclude air. The instrument is used as follows: The cylinder is placed over the selected vein which has been made turgid by compression, and the cupping-cup exhausted of air. The lancet is then fixed into the cylinder, the apparatus filled with tepid water, and the vein opened by the concealed lancet, after which the water is allowed to escape through a special canula provided for the purpose, the orifice of which is closed as soon as all the water has been discharged. The instrument having filled with blood, communication is established between the circulation of the blood-giver and that of the blood-receiver, by turning a stopcock in the efferent canula, and the flow of blood is aided by manipulation of the central bulb. Dr. Roussel lays great stress on the fact that his apparatus, being constructed of pure caoutchouc, is less liable to cause coagulation of the blood than instruments which are made of glass, metal, or vulcanised caoutchouc.

Mediate transfusion is performed by receiving the blood into an open vessel and preventing coagulation either by defibrination (beating with a glass rod) or by adding a few drops of liquor ammonia (Dr. Richardson), or a solution of phosphate of soda (Dr. Hicks).

The fluid is then transferred to the mechanical agent chosen to propel it into the patient's system. This



Fig. 99.—TO ILLUSTRATE DR. AVELING'S METHOD OF IMMEDIATE TRANSFUSION. (After Aveling.)

may consist of an ordinary syringe with fine nozzle, or one on Higginson's principle, or a glass funnel with elastic tube attached, the funnel being placed at a

considerable height above the patient, so that the blood may gravitate in the required direction. In whatever manner transfusion is performed, the great danger to be avoided is the introduction of air with the blood into the patient's system. Professor E. Martin of Berlin reports a series of fifty-seven cases of mediate transfusion after delivery, of which forty-five recovered, whilst the death of the other twelve cases did not result from the operation. The blood used was not defibrinated. Dr. Graily Hewitt also advocates the use of undefibrinated blood.

Professor Schäfer, F.R.S., has made a series of experiments for the Obstetrical Society on transfusion. These carefully-conducted observations are destined to modify the opinions previously held on transfusion. I cannot do better than give Professor Schäfer's conclusions in his own words:—

“ 1. Ordinary milk is highly detrimental, and ought never to be used for transfusion.

“ 2. Solution of salt and any other watery fluid is without permanent benefit, and should never be used for transfusion.

“ 3. The blood or serum of the lower animals is highly detrimental, and in large quantities fatal, and ought never to be used for transfusion in the human subject.

“ 4. The only fluid which can be employed with any benefit for transfusion in the human subject is human blood, and this may be either in the normal or in the defibrinated condition.

“ 5. The less the blood used for transfusion is suffered to come in contact with foreign surfaces the better is likely to be the ultimate result.

“ 6. Consequently, the more the apparatus used is simplified the better is likely to be the result.

“ 7. The simplest and best form of apparatus is

a short flexible tube, terminating in glass canulas, which is used to directly connect either a vein of the giver to a vein of the patient, or an artery of the giver to an artery of the patient.

"8. The amount of blood used may be measured by the time of flow. Enough blood would probably flow from vein to vein in three or four minutes; from artery to artery (towards the heart) in half a minute or a minute.

"9. In ordinary cases in which transfusion is required, it will probably be found most convenient to employ the method of direct transfusion from vein to vein, but in cases where death is imminent transfusion from artery to artery towards the heart ought if possible to be carried out.

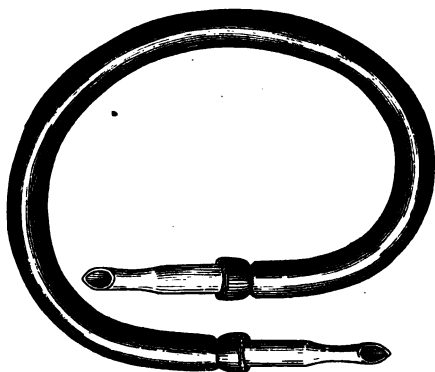


Fig. 100.—PROFESSOR SCHÄFER'S TRANSFUSION TUBE.

"10. Failing any person willing to submit to have a canula inserted into a blood-vessel, but, nevertheless, one being found ready to yield blood into a basin by the ordinary process of venesection, transfusion may yet be tried, although with greater risk to the

patient, by means of a syringe or elastic pump. The arm of the giver and the interior both of the basin and of the instrument ought to be washed thoroughly with hot water containing carbonate of soda in solution, and the blood injected quickly without defibrination, and with every precaution to prevent the introduction of air. Injection into an artery of the patient towards the heart, as recommended by Blundell, ought to be preferred to any other mode. If the injection is into a vein a funnel with an india-rubber tube provided with a spring clip and with the canula for the vein attached to the end of the tube is as simple and effectual an apparatus as could be devised."

The after-treatment of severe hæmorrhage is of the greatest importance: absolute rest, warmth, brandy, and beef-tea (the brandy and beef-tea being given very frequently in small quantities). When reaction has set in, opium is our mainstay. If there is much cephalalgia, ice and salines are useful. The cardinal point in the after-treatment is *not to allow the patient to assume the erect position, even for an instant*, until the pulse indicates that the circulation has fairly recovered itself, for in more than one case instant death has followed the violation of this rule.

## CHAPTER XXII.

## RUPTURE OF THE UTERUS.

RUPTURE of the uterus may take place either previous to or at the time of labour. The injury varies from small rents of the peritoneal, mucous, or muscular coats, to laceration of the entire uterine wall. When rupture takes place previous to parturition, the fundus is usually the seat of the injury. Atrophy of a part of the muscular wall; fatty, tubercular, or syphilitic degeneration; sudden fright, and mechanical injury, are some of the causes of this catastrophe. Rupture occurs more than twice as often with male as with female children.

The causes of rupture during labour may be divided into mechanical obstruction to delivery, mechanical injury, and disease of the uterine tissue. In the first division are included pelvic contractions, occlusion or rigidity of the os uteri, obliquity of the uterus, and abnormal development of the foetus. Arm presentations may be the cause of rupture when the uterus is allowed to contract upon the child without rectifying its position. The indiscreet performance of version is very liable to produce rupture, especially if the hand is forced into the uterus when the liquor amnii has long drained away. Sudden uterine action, as met with in hasty labour or after the administration of ergot, may, by its excessive violence, lacerate the organ. Long-continued pressure of the cervix between

the foetal head and pelvic brim, especially if this is sharply defined, has a tendency to cause rupture. I possess a pelvis with several sharp crests or spines developed along the linea ilio-pectinea, the patient having died from rupture of the cervix resulting apparently from the presence of these spiculæ.

When rupture is the result of pelvic contraction, the injury usually takes place at the anterior or posterior aspect of the cervix, sometimes separating it entirely from the vagina. Dr. Gervis relates a case of annular laceration of the cervix where a strip of the uterine wall, about half or three-quarters of an inch in width, was detached laterally and posteriorly for about ten inches, leaving two inches at the anterior aspect uninjured. The detached band of uterine tissue was at first taken to be a loop of intestine protruding through a rupture in the uterus, but further examination showed its true nature. The lacerated portion was replaced, the torn surfaces united, and the patient recovered. When the injury commences with a rent at the margin of the os, it extends in a vertical direction, not unfrequently following the course of the muscular fibres. The cause of the womb's neck suffering most severely in pelvic contraction arises from its being jammed immovably between the foetal head and maternal pelvis, and so rendered unable to yield to the contractions of body and fundus, which, in attempting to force down the child, puts such a strain on the cervix that at last it gives way. Dr. Radford shows that rupture is more likely to take place when the brim is just large enough to allow the head surrounded with the cervix to enter, and there become arrested, than when the deformity is too great to permit the head to descend so far.

When partial laceration takes place at the cervix, leaving the peritoneum entire, blood is effused be-

tween it and the muscular walls, forming a peri-uterine hæmatocele, or, as some prefer to call it, a thrombus; and this infiltration of blood may permeate the whole of the loose tissue between the uterus, bladder, and rectum. True hæmatocele takes place when the rupture extends through the peritoneal covering of the uterus, the blood being effused into the peritoneal cavity. Hæmatocele may also arise from the giving way of varicose vessels in the neighbourhood of the uterus. On several occasions, after difficult and tedious labours, I have found blood in the peritoneum, and have noticed that in such cases the external uterine vessels were much dilated, a frequent condition in women who have borne many children. The effused blood varies in quantity, sometimes being scarcely appreciable, sometimes being sufficient to push the uterus upwards and forwards towards the pubes. In this displacement, by introducing a uterine sound and by its aid making the uterus move independently of the general swelling, the fundus may be detected through the abdominal walls. The treatment of hæmatocele, in uncomplicated cases, is simply expectant. The effused blood is either absorbed or is discharged through the vagina, rectum, or abdominal wall. When the tumour obstructs delivery, it should be punctured to evacuate its contents.

Mechanical injuries producing rupture may be the result of unskilled attempts to induce premature labour by puncturing the membranes. This is the frequent sequence of criminal attempts to procure abortion. Careless introduction of obstetric instruments during labour may perforate the uterus.

A diseased condition of the tissue of the uterus, by rendering it friable, is apt to cause the organ to give way during labour; so also is the presence of cancer, or of interstitial fibroids.



*Symptoms.*—The symptoms are sudden, acute, abdominal pain, followed by immediate collapse, with or without external hæmorrhage. When rupture takes place during the early months of pregnancy it is not easy to distinguish it from rupture of the cyst in tubal or other form of extra-uterine gestation. Rupture during labour manifests itself by a sudden agonising pain, accompanied by a sensation as of something having given way, felt at the time of, or immediately after, a more than usually powerful uterine contraction. The rapid setting in of collapse, the scarcely perceptible pulse, vomiting, clammy sweats, rigors, hæmorrhage from the vulva, cessation of the uterine contractions, and recedence of the presenting part, with death of the foetus from detachment of the placenta, and probably its escape into the abdominal cavity, are signs of the occurrence of this terrible accident. If the rent is small, the symptoms at first are not so pronounced, hours sometimes elapsing ere the onset of the severer indications.

Rupture is generally fatal to both mother and child, either primarily, from shock and hæmorrhage, or secondarily, in the case of the mother, from peritonitis, metritis, pelvic cellulitis, or gangrene.

*Treatment.*—In impending rupture any conditions which may contribute to this result should, if possible, be removed; excessive uterine action is to be moderated by chloroform or opiates; rigidity of the os is to be obviated by the plans already discussed in the treatment of obstructed labour; pelvic contraction must be met by the induction of premature labour, or at full time, by other operative measures. If rupture has actually taken place, immediate delivery affords the best chance of life to both mother and child. If the os is undilated, first use Barnes' hydrostatic dilator, and then perform version; or, if the

head does not recede, the forceps may be applied. Pelvic contraction or other barrier to passage of the head demands craniotomy or the cephalotribe. When the child has escaped into the abdomen care must be taken not to bring any of the intestines along with it into the uterus, and if any protrude, they should be replaced if possible. Sometimes the child cannot be brought back through the rent in the uterine wall owing to contraction of the aperture, in which case the only resort left is abdominal section. During the stage of collapse, stimulants are all-important, and afterwards the free administration of opiates.

*Laceration of the Vagina.*—Laceration of the vagina, at the upper part, is usually associated with rupture of the cervix uteri; at the lower part, the perineum generally goes with it. Longitudinal rents in the mucous membrane not unfrequently occur, especially if the size of the foetal head is disproportioned to that of the passage; if the sub-mucous tissue gives way and the membrane remains entire, thrombosis results; long-continued pressure of the head may cause a portion of the vaginal wall to slough away, giving rise to vesico-vaginal fistulas.

The vulva generally undergoes slight laceration of the mucous membrane during passage of the head, the posterior commissure being usually the part injured. If the perineum is very rigid, or if labour is hasty, the laceration may extend partially or entirely through the muscular tissue, and even through the sphincter ani, laying open the rectal and vaginal cavities into one. It has happened through smallness of the angle formed by the pubic arch, and the head advancing too much in the posterior direction, that the perineum has been perforated, the child passing between the anus and vulva, both these apertures remaining intact.

Lacerations of the vagina require no special treatment unless the hæmorrhage is severe, when the application of ice or perchloride of iron becomes requisite; laceration at the upper part, where the cervix uteri is attached, must be treated in the same manner as rupture of the uterus. The edges of a perineal laceration should be cleansed and immediately united by ligatures, and to prevent stretching of the part, the legs must be bound together. If ligatures are not inserted early the wound will heal by granulation. In either case cleanliness is of the greatest importance. If the rent does not go through the sphincter ani, the injury causes but slight trouble; the patient perhaps complaining of a little extra smarting, but being otherwise unconscious of anything unusual having taken place.

## CHAPTER XXIII.

## INDUCTION OF PREMATURE LABOUR.

UNDER certain circumstances, the full term of gestation cannot be arrived at without involving great peril, or even death, either to the mother, to the child, or to both. We therefore seek to anticipate the natural term by the induction of premature labour, and thus to avert the threatened mischief. The conditions which demand this operation include contractions of the pelvis or soft parts, pelvic or abdominal tumours, malignant disease, irreducible anteversion and retroversion of the uterus, uncontrollable placental hæmorrhage, cardiac or pulmonary disease—causing urgent dyspnœa—convulsions, and persistent vomiting, or diarrhœa.

The fitting period for the induction of premature labour depends upon a due consideration of the urgency of the symptoms, and the prospective viability of the fœtus. For instance, if the patient suffers from excessive and persistent vomiting, and the strength is evidently becoming so far reduced as to imperil life itself, the uterus must be relieved of its contents, irrespective of the age of the fœtus. On the other hand, if a moderate degree of contraction of the pelvis constitutes the difficulty, it will be our duty to wait until the child has reached a period of its existence sufficiently advanced to insure it a fair chance of surviving a preternaturally early expulsion.

The child can scarcely be said to be viable until the end of the seventh month. There is frequently some difficulty in calculating the exact age of the foetus even when the time of the cessation of the menses is known; on the one hand there is the risk of procuring the expulsion of a non-viable child, and on the other of allowing development to proceed so far as to necessitate craniotomy. The period usually chosen is from 230 to 250 days, the former being considered the minimum time. In pelvic contractions the time to operate must depend upon the degree of distortion. If the conjugate diameter is above  $2\frac{1}{2}$  inches, a viable child may be born; if under this measurement labour must be induced at a period so early that the probability of the child's survival is but slight; of course the nearer the child is allowed to proceed to the full term, provided it can pass through the narrow canal, the greater the chance of its survival. Sometimes, from causes solely originating in the child, it is necessary to anticipate the natural period of delivery—as when the maternal pelvis being of normal size, dystocia is repeatedly produced in the same woman through excessive size of the foetal head, or from advanced ossification having rendered it rigid and unyielding. Some women repeatedly bring forth dead children at the full time, the result usually of placental degeneration, which, by interfering with the nutrition of the foetus, causes its death. In either case, if we shorten gestation by two or three weeks, we may generally obtain a successful result. In cases dependent upon degeneration of the placenta, it is well, during the last few weeks of pregnancy, to examine day by day the pulsations of the foetal heart with the aid of the stethoscope, so that when any change takes place in its rapidity or regularity, we may be ready to proceed to immediate delivery.

*Methods of inducing Premature Labour.*—The agents used to effect the induction of premature labour may be divided into those which act on the uterus through the maternal system, and those which act directly on the organ itself. The indirect agents include the administration of ergot (Ramsbotham), galvanism (Radford), friction on the fundus uteri (d'Outrepont), and mammary irritation by suction (Scanzoni); but these uncertain methods have given place to the more direct means of exciting uterine action we have now to consider.

Denman advocated the plan of puncturing the membranes with a quill; a method very certain to induce labour, but one dangerous, unfortunately, to the child, as the uterus, on the escape of the liquor amnii, contracts forcibly on the foetus, and frequently causes its death, a result all the more likely to take place from the resistance offered by the undilated cervix through absence of its natural hydrostatic dilator, "the bag of waters." If the foetus is dead or non-viable, or if an immediate reduction in the size of the uterus is desirable, the foregoing objections do not apply. Occasionally, after the first gush of liquor amnii, the child's head blocks up the aperture in the membranes, and so retards the escape of the remaining fluid, and the child in this case is placed under much more favourable circumstances than when the liquor amnii comes away *en masse*.

Hopkins and Meissner proposed puncturing the membranes some distance from the os, and for this purpose devised special instruments; but the objections to this modification are the difficulty of its performance and the risk of injury to the uterus. Braun devised the plan of introducing into the vagina a hollow india-rubber ball, which he called a colpeurynter, and then distending it with water, but

the result is uncertain ; the instrument causes a considerable amount of pain, sometimes followed by violent inflammation. Cohen recommends an elastic catheter to be passed up a few inches between the membranes and uterine wall, and tepid water to be injected through it. Lazarewitch also advocates this measure, with the addition of insisting that the catheter shall be carried up as near the fundus as possible, as it is here that uterine action is initiated. Kiwisch is content to inject the water into the vagina against the uterine cervix. These douches, whether intra or extra uterine, are more or less dangerous, having frequently produced fatal results from the admission of air into the uterine veins, and from other causes, and are therefore not to be recommended.

Hamilton advised the separation of the membranes round the os by the finger or uterine sound—an uncertain plan, which has given way to a method advocated by Krause, who passes an elastic bougie some inches up between the membranes and wall of the uterus, and allows it to remain until labour sets in. In Krause's method labour does not appear to be uniformly due to the separation of the membranes from the uterus, as when the bougie is accidentally displaced the result is frequently negative. It seems, however, that the irritation caused by the presence of a foreign body in the uterus is a tolerably certain means of initiating labour. My late colleague, Mr. Whitehead, added an air-pessary to the elastic bougie, which fulfils the double purpose of keeping the instrument *in situ* and of distending the vagina. Sir J. Simpson suggests that any risk of wounding the placenta may be avoided by ascertaining its position by means of the stethoscope, and, given this precaution, the operation is a safe and certain way of inducing premature labour.

Mechanical dilatation of the os has been frequently proposed as a means of exciting uterine action. Metallic dilators, laminaria, and sponge-tents, have all been used for this purpose. Tarnier uses a modification of Barnes' bag in the form of an intra-uterine dilator of caoutchouc, which is introduced above the internal os, and distended with water. My friend Dr. Thorburn speaks approvingly of Tarnier's apparatus for the induction of premature labour, and has made some modifications and improvements in it. I, too, have found it efficient in several cases. Dr. Keiller of Edinburgh was the first to introduce an elastic dilator within the uterus, and afterwards Dr. Barnes developed this process to great perfection, his well-known fiddle-shaped bags affording the best means of artificially dilating the os. Dr. Godson strongly advocates the use of sponge-tents inserted between the cervix and membranes by means of an instrument specially made for the purpose,—and thus describes the operation:—"My mode of procedure consists in insinuating, night and morning, between the cervix and the membranes, sponge-tents of gradually increasing size; the first and each succeeding one being as large as the parts will admit. On removing each tent, and before replacing it by another, a warm douche containing Condry's fluid is administered. I have found the use of one, two, and three tents to be sufficient, and have never had occasion to employ more than four. This method causes little or no anxiety on the part of the patient; and until labour sets in she moves about without pain or inconvenience, regardless of the presence of the tent." From time to time I have tried most of the above methods, and have come to the conclusion that the combined plan of excitation and artificial dilatation of the uterus as recommended by



Barnes is the most efficient. Excitation is effected by insinuating a bougie after the manner of Krause, withdrawing it when uterine action is established, and then introducing a hydrostatic bag within the os, to produce dilatation. Labour can thus be induced with certainty and celerity, the whole process not occupying more than twenty-four hours. Dr. Godson's method is also very efficacious.

The best method of inducing abortion in the early months is to introduce the uterine sound within the os internum and move the instrument round; but if the uterus is so far retroflexed as to render it impossible to pass the sound through the os, the ovum must be punctured through the posterior uterine wall.

## CHAPTER XXIV.

## VERSION.

VERSION or turning is an operation to artificially change one presentation for another, and is divided into three varieties, known as *cephalic*, *pelvic*, and *podalic*. The operation itself is performed in three different ways—viz. by external, and by internal manipulation, and by a combination of the two. In the early days of obstetrics cephalic version was the favourite method. In the fifteenth century Ambroise Paré and his pupil Guillemeau advocated the podalic form, which continued to hold the chief place in obstetric operations until the introduction of the forceps, when it fell into comparative disuse. Of late years it has been reinstated to its proper position amongst our means of artificial delivery, as one which, besides its other advantages, enables us, not unfrequently, to forego the otherwise inevitable perforator.

The cases which demand the performance of version include malposition of the child, pelvic contraction, hæmorrhage, prolapse of the funis, and rupture of the uterus. To the first of these only the *cephalic* form of version is applicable. The object of this operation is to convert a faulty presentation into the ordinary cranial position, and then allow labour to take its natural course. The operation is one which is not very frequently resorted to, partly because it is difficult to perform, partly because it is possible

only at the early stage of labour before uterine contraction has taken place. It is best performed by Dr. Braxton Hicks' method of combined external and internal manipulation, or, as some prefer to call it, bi-polar version. A portion or the whole of the left hand having been introduced into the vagina and one or two fingers passed within the os, the right hand is placed on the abdomen and, by the combined action of the two hands, the position of the fœtus is changed. If the shoulder presents it should be pushed up with the fingers of the left hand whilst the head is depressed by the right; when the head is fairly over the os, it is best to rupture the membranes, so that the uterus may contract and prevent further movement of the child.

Wigand was the first to suggest version by external manipulation; his method consisting in first ascertaining the presentation and then depressing that pole of the fœtus into the os which is nearest to it; this is done solely by external manipulation, the hand within the vagina taking no active part in the operation, but merely passively receiving the part brought down. This operation is limited to the rectification of malpresentations. Dr. Braxton Hicks greatly improved and modified this plan, and developed it into a very valuable obstetrical resource, by making use of the internal hand to assist in turning the child. Cephalic version has the advantage of not interfering with the performance of podalic version, should it afterwards be deemed necessary; it is therefore much to be commended, especially as it is one of the most conservative of obstetric operations, the interference with both mother and child being reduced to a minimum.

*Pelvic Version*, or turning by the breech, is seldom performed, as all its supposed advantages are fulfilled

by podalic version, one foot only being brought down, with the benefit of being able to accelerate delivery in accordance with the requirements of the case.

*Podalic Version.*—This method of turning, which is the one usually resorted to, has for its object the extraction of the child by the feet. There are two ways of performing the operation, either by passing the hand within the uterus and seizing the feet, or by combined external and internal manipulation with at most one or two fingers in the uterus.

In all varieties of turning chloroform renders the greatest assistance, and in many cases is absolutely necessary; it has almost entirely superseded general bleeding and the administration of tartar emetic in spastic rigidity of the uterus. Its full administration curbs the ordinary uterine contractions, which often place considerable difficulty in the way of the operator; it prevents unexpected jerking movements on the part of the patient, which might lead to rupture of the uterus during the progress of the operation; and finally, it is of great service by relaxing the abdominal muscles to such an extent as to enable us to ascertain by external examination the child's position, which otherwise would frequently prove impossible.

I will first describe Dr. Braxton Hicks' manner of performing the combined method of podalic version. The patient is placed on her left side and the operator's left hand is introduced into the vagina as in cephalic version, the right being placed on the abdomen. It is well, before proceeding so far, to ascertain by palpation the position of the breech, that of the head, if presenting, being recognised by the situation of the fontanelles. When the head is in the first or fourth position it should be pushed up to the left, the breech being simultaneously depressed to the right; this manipulation is continued until the head has passed

out of reach ; the shoulder then comes in contact with the fingers and is treated in the same manner until the knees are felt, when the membranes are ruptured and the legs brought down. In the second and third

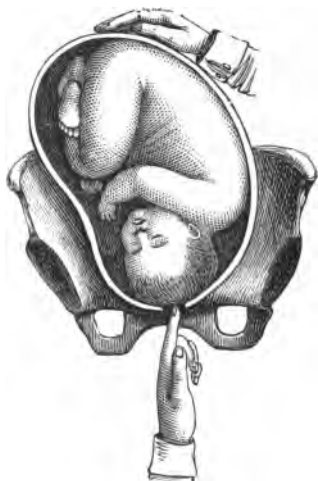


Fig. 101.—FIRST STAGE OF BI-POLAR VERSION.  
(After Hicks.)

positions the head must be elevated to the right, the breech being depressed to the left. If the presentation is obscure it is best to treat it as if in the first position. Shoulder presentations are to be treated after the same plan ; the shoulder being raised in the one direction, whilst the breech is depressed in the other. Extra assistance may sometimes be given to the movement by making occasional use of the right hand externally to elevate the head. It need scarcely be observed that these various manipulations are to be carried on only in the intervals between the pains.

The two great advantages of Dr. Hicks' plan are that the operation can be performed at an early period, and in case of non-success we can at once

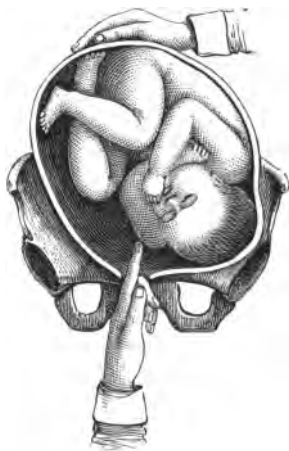


Fig. 102.—SECOND STAGE OF BI-POLAR VERSION.  
(After Hicks.)

proceed to podalic version without having created any extra difficulties by our previous efforts.

In the common form of podalic version the hand within the uterus does the principal part of the work, but it must not be therefore inferred that the other hand is idle or useless; on the contrary, both hands are quite as necessary as in the combined plan. The operation is thus performed: The patient is placed on her left side, with the legs separated; the hand of the operator, after being lubricated on its dorsal aspect, is then gently passed up the vagina, with the fingers gathered together at their tips, as previously directed.

The choice of hand is a matter on which no absolute



Fig. 103.—BI-POLAR VERSION—SEIZING THE KNEE.  
(After Hicks.)

rule can be given, inasmuch as it depends upon the



Fig. 104.—PODALIC VERSION—SEIZING THE FEET.

nature of the case, and upon the degree of ambidex-

terity possessed by the operator ; the left hand, however, adapts itself most readily to the curve of the pelvic axis, and if properly educated may attain a degree of tactile power equal to that of the right. This adaptability, however, is, as a rule, more than counterbalanced by the fact that the right hand, from



Fig. 105.—PODALIC VERSION—BRINGING DOWN THE FEET.

the habitual preference accorded to it in all the actions of daily life, attains not only a greater degree of digital strength, but is also much better able to endure the fatigue, ending in powerlessness, produced by pressure of the uterus. Some writers give a series of rules to determine which hand shall be used in each particular case, though the rational principle appears to be that when the infant's back is towards the maternal abdomen, the left hand should be used, and when the foetal abdomen is towards the maternal abdomen, the right. I would urge practitioners to



accustom themselves to the occasional use of the left hand in all obstetric operations, as there are times when its efficient assistance can ill be spared.

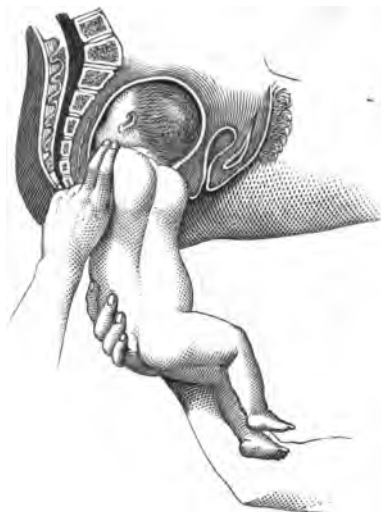


Fig. 106.—PODALIC VERSION—EXTRACTION OF SHOULDER.

Whichever hand the operator elects to use, it should be passed up to the os, and then, whilst the uterus is steadied with the other hand, slowly insinuated with a semi-rotary movement during the interval between the pains, care being taken to follow the curve of the genital canal. The hand is then passed along the abdomen of the child, and the feet or knees are seized and brought down in the absence of a pain. It is sometimes advantageous to bring down one foot only, as the increased bulk of the child's trunk thus produced dilates the soft parts more fully, and so renders the head's passage easier. Tyler Smith,

Simpson, Barnes, and others, recommend that the foot opposite the presenting arm should be selected and brought down, by passing the hand along the palmar aspect of the child's arm, diagonally across its abdomen to the opposite leg. Dr. Galabin, in an elaborate and most interesting paper published in



Fig. 107.—VERSION IN TRANSVERSE PRESENTATION.

the *Obstetrical Transactions*, vol. xix., defends the custom of bringing down the lower leg in preference to the one of the opposite side. Dr. Galabin sums up the advantages of seizing the lower knee in these words:—"1. The rotation of the foetus on its antero-posterior axis by means of the lower leg is generally effected at a greater mechanical advantage, and therefore by a less force, than the combined rotation on its transverse and longitudinal axis, by means of the upper leg; while it is sufficient to produce elevation of the shoulder, unless the foetus is dead and flaccid or uterine rigidity extreme, and the upper leg may, with no diminished advantage, be afterwards brought down

if required. 2. If the lower leg be taken, and a noose placed upon the prolapsed arm, the operator has complete command of the anterior arm in the subsequent extraction. 3. By taking the lower leg the more usual dorso-anterior is not converted by the version into a dorso-posterior position, a point of very minor importance, but one which may in some cases be worthy of consideration." The foot is most readily discriminated from the hand by noticing the projection of the heel, and the knee from the elbow, by remembering that the apex of the angle formed by its flexion points to the head, whereas in the elbow it is directed to the feet.

With the membranes unruptured, or only recently broken, the performance of version is a tolerably easy matter; but it is by no means easy when the liquor amnii has long drained away, and the uterus is firmly contracted upon and adapted to the shape of the child; the shoulder (if the presentation be transverse) is then jammed tight in the pelvis; the whole parturient canal is hot, tumid, and dry; the patient is restless, and worn out with fatigue; her spirits are depressed with the fruitlessness of her exertions, and she shrinks from the gentlest attempt at examination. Cases such as this test the benefits of chloroform inhalation; not only is pain subdued, but the muscular tissue of the uterus becomes so far relaxed as to render feasible what otherwise would be a sheer impossibility. In this condition the precautions previously enjoined must be observed with tenfold minuteness; the hand, on reaching the os, must be introduced with the minimum amount of force, the great secret of success being to allow plenty of time for each little advance. This is very fatiguing to the hand, but occasional rests should be made, the elbow of the engaged hand being supported on

the bed, so as to afford temporary relaxation of the muscles. Whilst the hand is within the uterus it should be kept as close to the child as possible, care being taken not to present the protruding knuckles to the uterine parietes, especially during the pains, when it should be spread out flat. By the observance of these precautions, and by the exercise of a due amount of patience, success seldom fails us. If, when the foot is brought down, the shoulder remains fixed in the brim, and refuses to rise, a loop of tape should be passed over the foot, either by the hand or with the aid of an instrument similar to that used in prolapse of the funis, and traction made, whilst the shoulder at the same time is pushed up in the direction of the fundus.

In a case of placenta prævia, where version is resorted to, the hand should be passed through that side of the os to which the placenta is least adherent, and when the membranes are reached they should be ruptured, and the feet sought for and brought down. The rupture of the membranes is not usually attended with an immediate discharge of the liquor amnii, as the arm of the operator plugs the os, and so prevents or retards its egress, hæmorrhage from the torn placental vessels being also checked by the same means. Here, as when version is required from other causes, much assistance may be afforded by the judicious employment of the unengaged hand externally, by pressing on the breech, and so bringing the lower extremities within reach of the hand within the uterus.

The relative merits of version, long forceps, and craniotomy in cases of contracted pelvis, have been made the subject of much discussion. Simpson advocated version on the grounds that the foetal head resembles a truncated cone, whereof the vault of the cranium forms the widest part; and when the head

presents in the usual manner, the base of the cone is applied to the pelvic brim, and being too large to enter, becomes spread out by the pressure to which it is subjected from above, and is thus rendered still less adapted for passing through the contracted opening. If, on the other hand, version is resorted to, the smallest end of the cone is first applied to the strait through which it passes, until the diverging walls of the cranium bind against the margin of the brim, and further progress is temporarily arrested. The advantage of the plan advocated now becomes apparent, for the sides, instead of the base of the cone, are subject to pressure from the pelvis, and, as a consequence, the diverging angle formed by the child's head is lessened, the head itself being elongated vertically, but diminished laterally, which is the converse of what previously took place. There is yet another point in favour of version in contracted pelvis; when the head presents, the chin is flexed on the sternum, and, as a consequence, the bi-parietal portion of the cranium first enters the brim immediately in the diminished conjugate diameter; when version is performed, the head is extended, and the bi-temporal portion passes through the narrowest part, the bi-parietal coming through the lateral and wider portion of the brim; now the bi-parietal diameter exceeds that of the bi-temporal by half an inch.

There can be no doubt that version may be frequently substituted with advantage as an alternative to craniotomy; for even if delivery cannot be accomplished by version, perforation can still be resorted to, and we have, at any rate, given the child a chance of life. This, of course, applies only to cases adapted to the performance of version, otherwise the risk to the mother counterbalances the possible benefit to the child.

With the substitution of turning for the long forceps I cannot so readily acquiesce, for, when the forceps are carefully applied and traction made with due regard to the varied direction of the pelvic axis, I do not think the danger to the mother is greatly increased, whilst the child has certainly a better chance of life; for, in version, whilst the head is being moulded to the requirements of the brim, the cord is undergoing compression. A prolonged degree of moulding in cephalic presentation may be undergone with impunity, as the circulation is not interfered with, and the child suffers little from the compression of the head; but in footling cases this is very different, as, do what you will, the cord can scarcely be preserved from fatal pressure during the delay which ensues when the head engages in a contracted pelvis; so that, except under peculiar circumstances, where they appear to be contra-indicated, I prefer the forceps to version in contracted brim. When the foetus is dead and firmly impacted in the pelvis, the mother being in an exhausted condition, version should not be attempted; in such cases the proper treatment is decapitation, or Dr. Barnes' operation described at page 292.

The employment of version in cases of prolapse of the funis and in rupture of the uterus is considered when treating on these subjects.

## CHAPTER XXV.

## THE FORCEPS.

THE forceps is an instrument constructed for the purpose of affording to the accoucheur a means of grasping the child's head, making traction, and of altering its position whilst in the parturient canal. The forceps was known in ancient times, but the merit of re-inventing this instrument is due to Dr. Peter Chamberlen,<sup>1</sup> who lived about the year 1640. For a time the instrument was kept a secret, the Chamberlen family meanwhile acquiring great reputation in the treatment of difficult labours. By degrees the secret crept out, and the forceps, like many other useful inventions, had to stand the severe test of injudicious use; turning consequently fell into comparative neglect, the forceps being employed in season and out of season, until the inevitable reaction set in, which caused the instrument to be looked upon with unmerited disfavour and to be avoided except as a last resource. Happily a more logical appreciation of this instrument now exists, the forceps having its legitimate range of action, within which all unprejudiced operators use it without hesitation.

There are two kinds of obstetrical forceps, long and short; the long adapted for use when the foetal head is either above or below the brim; whilst the short can be used only when the head is near the

<sup>1</sup> Aveling.

outlet. The short forceps consists of two curved, fenestrated blades, which, when placed in opposition, describe an ellipse about 7 inches in length by  $2\frac{3}{4}$  inches in diameter. The blades are furnished with

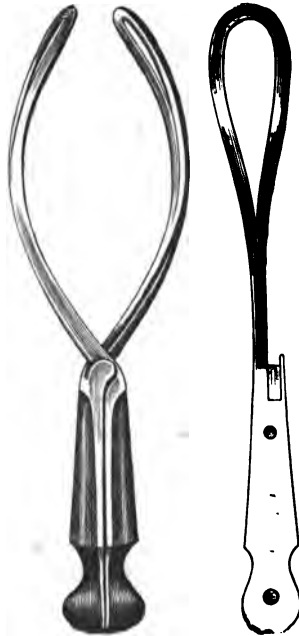


Fig. 108.—SHORT STRAIGHT FORCEPS.

wooden handles, and have an arrangement, called the lock, by which they can be united. This instrument has undergone several modifications,<sup>1</sup> from time to time, but still retain the general characteristics of Den-

<sup>1</sup> Those of Sir James Simpson and Dr. James Braithwaite being the most useful and convenient.



man's forceps. The short forceps, owing to inadequate length and non-adaptability to the curve of the pelvic canal, is not applicable when the head is high up. The instrument has sometimes been lengthened by the addition of a straight shank between the curved portions of the blades and the handles; but such an instrument cannot be applied to a head high up in the pelvis without rendering the soft parts of the mother liable to severe contusion and laceration. To obviate this difficulty a second curve has been added at right angles to the cranial curve, so that the fenestra, instead of being in a straight line with the handles, form a curve which gives them a direction forwards from the perineum, however high the situation of the head. It is found practically that the long forceps with the second curve is equally adapted whether the head is high or low; and as it is convenient to have one instrument available for two purposes, the practitioner generally contents himself with a pair of long forceps for use in all positions of the head.

There are numberless modifications of the long forceps, every accoucheur having his pet instrument, which, in most instances, differs from the ordinary form to so slight an extent that the designer himself is the only person able to appreciate the improvement. The instrument with which Roberton's name is associated is an excellent form of forceps; so are the forceps of Barnes, of Greenhalgh, and of Simpson, which have moreover the advantage of affording a purchase for hooking the fingers over the handles, and thus facilitating traction. Dr. Graily Hewitt has devised a modified form of forceps for use when the foetal head is unusually elongated through being forced along narrow or unyielding passages. Dr. Aveling proposes to curve the handles backwards, so as to increase the grasp and power of traction. Dr. Galabin has designed

a long forceps with the shanks curved in such a manner as to enable the operator to make traction in the correct axis of the pelvis. The usual dimensions are—length of curved portion of blade,  $6\frac{1}{4}$  inches; straight portion,  $2\frac{1}{2}$  inches; fenestrum,  $1\frac{1}{4}$  inch at the widest part; ends of blades,  $\frac{7}{8}$  inch apart; and  $2\frac{7}{8}$  inches at the widest part between them when the

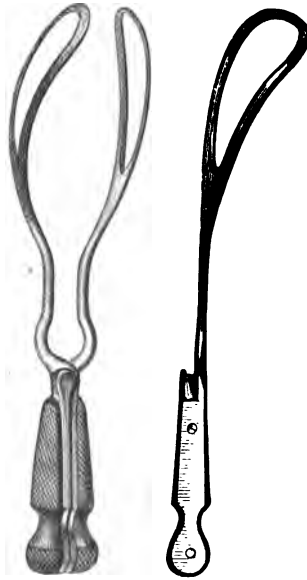


Fig. 109.—LEVER'S LONG FORCEPS.

handles are closed; the pelvic curve being about  $1\frac{1}{4}$  inch.

Dr. Radford designed a pair of long forceps with blades of unequal length, the longer blade being intended to go over the face, and the shorter blade over the occiput. The forceps bearing the name of Pro-

fessor Tarnier of Paris possess certain distinguishing features evincing great mechanical ingenuity. M. Tarnier attributes the following defects to the ordinary long forceps: "First, of never allowing the operator to exercise traction in the axis of the pelvis; second, of never leaving to the foetal head a sufficient mobility to enable it to follow truly the curve of the pelvis." The instrument about to be described he devised with a view of remedying these defects. AA (Fig. 110) are the prehensile branches which represent the blades of an ordinary pair of forceps; to these the tractors B are united by an articulation C, movable in all directions. The tractors are so curved that traction is made in a straight line from the centre of the foetal head to the handle D,

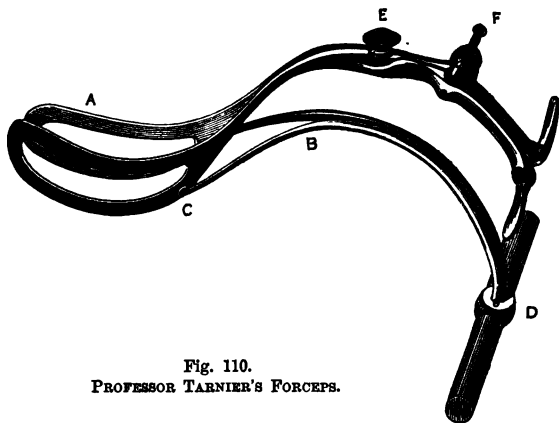


Fig. 110.  
PROFESSOR TARNIER'S FORCEPS.

the result being that the head when above the pelvic brim is drawn backwards into the hollow of the sacrum, and not against the pubic arch, as is the tendency with the ordinary long forceps. The pre-

hensile branches cross and lock in the continental fashion with a screw E. A second screw F is affixed to the prehensile blades, by means of which they can be made to grasp the foetal head with the requisite amount of pressure. The instrument is applied according to the ordinary rules: each prehensile branch is introduced along with its tractor, and afterwards locked with the screw E: the stems of the prehensile branches act as an indicator to the line of traction, and if the tractors are maintained in a position parallel to them, separated by a space of about one *centimètre*, the operator draws exactly in the axis of the pelvic canal. The advantages claimed for this instrument are somewhat numerous. It is stated that less force is required, that there is no injurious compression on the maternal parts nor on the foetal head, that the blades seize the head without projecting over it, that there is no tendency in the blades to slip off the head, that the head is free to follow the pelvic curve, and finally, that the transverse traction handle gives greater power, whilst the indicating handle shows how the power ought to be directed.

The blades of forceps, whether long or short, should be highly polished, so as to reduce to a minimum the friction caused by passing them between the child's head and the pelvis. It is very convenient to have the steel electro-plated with nickel, which resists the oxydising properties of animal fluids, and, when not in use, obviates the necessity of keeping the blades coated with grease.

The forceps are used principally as a means of traction, but they can bring to bear the two accessory forces of leverage and compression, both, however, to a slight extent compared with their tractile force. It is as a lever we use the forceps when we impart to

the handles an undulatory motion; the power being at one end, the fulcrum, represented by the child's neck, at the other, and the head or weight between the two, thus constituting a lever of the second order.

The cases demanding the use of the forceps may be arranged under three heads—uterine inertia, mechanical obstruction, and threatened danger to the life of



Fig. 111.—DELIVERY BY DR. RADFORD'S LONG FORCEPS.

mother or child. In inertia great care must be taken not forcibly to empty the uterus without allowing time for it to contract. Contraction may be generally induced by grasping the uterus externally with the hand, and exercising a fair amount of pressure. The perverted old adage that "meddlesome midwifery is bad," has long stood in the way of an early application of the forceps in uterine inertia; so has the

observation, often urged, that as no mechanical obstruction existed, nature required only time to conclude her work unaided. In some instances, doubtless, this may be true; but unfortunately this overweening trust in the abstraction called "nature" tends often to disastrous results, so that, whilst futilely waiting and hoping, the patient's ebbing powers too plainly show that mischief has set in, and the over-cautious attendant is at last compelled to resort to the mechanical means he ought to have adopted long before the reduction of the suffering woman to a condition unfavourable, both locally and generally, for operative interference. Rash and inconsiderate measures I would not be thought to encourage. On the contrary, care and caution should ever be the watchwords of the obstetrician; but we must not let our caution warp our judgment, and so delay a comparatively simple and harmless procedure until it becomes a difficult and dangerous operation. The after evils consequent on this procrastinating plan—inflammation, sloughing, vesical fistulæ, etc.—often wrongly put down to the use of the forceps, are more justly to be attributed to undue delay in resorting to it.

In a paper published in the *Obstetrical Transactions* for 1877, Dr. Edis ably advocates a rational use of the forceps. After observing that as a rule the forceps is not required in simple cases of tedious and difficult labour until the completion of the first stage, Dr. Edis proceeds to state that when from early rupture of the membranes, or from inefficiency of the uterine action, the first stage is very prolonged, and the patient's powers are becoming exhausted, the forceps should be applied without further delay, and not postponed as a *dernier ressort*. Dr. Edis considers that the forceps is to be preferred to ergot in cases of uterine inertia; but that as a general rule it should

not be employed to complete delivery where we have good reason to believe that the child is dead in those cases where the head is firmly impacted in the pelvis. My friend Mr. Hardie (*Edinburgh Medical Journal*, 1876) vigorously advocates timely resort to the forceps in place of the dilatory action usually recommended by the older obstetrical authorities.

Mechanical obstruction is treated of in the sections on obstructed labour and deformities of the pelvis; the limits within which the forceps can be safely used are there indicated.

As delay in the second stage of labour may cause danger to the child, the practitioner should make a point of ascertaining, by auscultation, the actual state of the foetal circulation; and, if it begins to flag, he is justified in using the forceps, provided it is not otherwise contra-indicated. In prolapse of the cord, the child being in danger and other means failing, the forceps may be used.

The complications imperilling the life of the mother, and demanding, under certain conditions, the use of the forceps, are convulsions, rupture of the uterus, and hæmorrhage, which are all considered under their respective heads.

*Application of the Forceps.*—Before applying the forceps it is necessary to ascertain whether the maternal structures are sufficiently relaxed and dilated. It is usually held that the os uteri should be so fully dilated that its margin is out of reach of the finger; but this rule is too hard and fast always to hold good, for sometimes the anterior lip descends before the head, and becomes compressed between it and the pubis, and ere it can be released the forceps may be required. Other exceptions are also met with. In the majority of cases, however, it is well to let the os dilate to the utmost before applying the forceps. The vagina and

perineum should be relaxed so far as to accommodate themselves to the advancing head—a rigid perineum demanding the exercise of the greatest care—and plenty of time should be allowed to permit it to yield without laceration.

The patient is placed on her left side, with her knees drawn up to the abdomen, the trunk lying across the bed, and the nates close to and even slightly overhanging its edge. The inexperienced practitioner will do well to observe that the last direction is fully carried out, otherwise he will find it impossible to introduce the instrument, and will be compelled to desist until the proper position is assumed. Now, the state of the rectum and bladder should be ascertained; the rectum should be palpated through the vaginal wall, and, if it is distended, an enema should be used, and even though the patient is said to have passed water but a short time before, a catheter should be passed—a precaution invariably to be taken.

The next step is to ascertain the position of the foetal head by feeling for the ear, or if this cannot be felt, by an examination of the sutures and fontanelles, as directed in the section on mechanism of labour.

The application of the short and long forceps is conducted on two different principles, the short being governed by the position of the child's head, and the long solely by the course of the pelvic canal. Now, although the practitioner may be in the habit of using but one instrument, and that a long one with double curves, still, when it is used in cases suitable for the short forceps, that is, when the head is low down in the pelvis, the rule which governs the application of the short forceps holds good. When, however, the same instrument is passed up to the brim, it must follow the pelvic axis irrespective of the position of the foetal head. The most favourable position for the



application of the forceps to the head is that in which the blades pass over the parietal protuberances; and it is to accomplish this end we adapt the instrument to the position of the head when low down in the

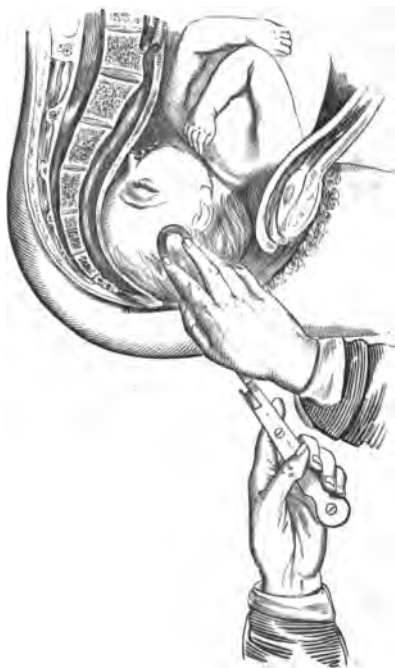


Fig. 112.—INTRODUCTION OF THE FIRST BLADE OF THE FORCEPS.

pelvis. When the head is above the brim, however, the bi-parietal diameter is in the antero-posterior diameter of the pelvis, and it would be impossible, both from want of space and from the curved direction of the pelvic canal, to apply the forceps so as to

embrace the head laterally; we are therefore compelled to be governed by the maternal structures, and to seize the head in its long diameter, or nearly so. Some practitioners always introduce the forceps solely



Fig. 113.—INTRODUCTION OF THE SECOND BLADE OF THE FORCEPS.

with regard to the pelvis, even when the head is low down. Ramsbotham favours this plan.

We will now suppose that the forceps is to be used with the head low, and the face in the hollow of the sacrum. Before introducing the instrument the

blades should be raised to the temperature of the body by immersion in warm water, and then lubricated with lard or cold cream. The upper blade is now selected (the distinction between the blades is readily made by locking them and holding them in position), and held lightly in either hand; the unoccupied hand is then passed along the vagina, and the child's ear is sought for. The tips of the fingers now rest on the head, and help to guide the instrument, which is gently slipped up between the fingers and the head, the handle being first depressed so as almost to touch the left thigh of the mother. Care must be taken to keep the end of the blade in contact with the head, as it glides round it. This gives an upward direction to the handle, which is made to advance by slight lateral oscillations, very little pushing force being used, until at last it arrives in position. The handle is then moved forward and given in charge of an assistant, whilst the lower blade is introduced in a similar manner to the upper one, except that the movement of the handle is reversed, being first raised and then gradually depressed. Care must be taken to pass the second blade in the same plane as the first, else it will not inter-lock. The second blade being in position, the handle of the upper one is brought towards it, when they ought, if they have been properly introduced, to lock without difficulty. In locking the blades the operator must guard against injuring the soft structures of the mother, or including any hair in the lock. If the handles fail to meet with parallel faces, one or both blades must be partially or wholly withdrawn and rearranged until the proper position is secured. No attempt must be made to lock the instrument so long as the handles fail to approach each other in the same plane, this non-adaptation being a proof that the blades do not embrace the head properly. The forceps

must be introduced only in the absence of uterine contraction, and we must cease action during a pain. The principal thing to remember in applying the forceps is that the blades will find their way with *very little force* if introduced in a proper manner, so that we



Fig. 114.—DELIVERY BY SHORT FORCEPS IN FIRST POSITION.

must never seek to overcome any resistance by pushing, but rather withdraw the blades and begin again. The handles being satisfactorily locked, and not too firmly compressed, the extraction of the foetus is now commenced by making traction in the axis of the brim. To this is added a slight to-and-fro move-

ment of the handles, whereby the leverage of the instrument is brought into play. If uterine action is going on, traction must be made only during the pains. If the pains have entirely subsided, traction should be made intermittently, so as to imitate the natural course of events. During each remission the pressure must be taken off the handles, continuous compression of the child's head being injurious.

As the head descends the handles are carried more and more forwards, describing the segment of a circle whose centre is at the pubic symphysis, until, at the moment of extraction, they are close to the maternal abdomen. The downward progress of the head may be estimated by the gradual distension of the perineum, to avoid rupturing which the handles must be carried well forward and the palm of the left hand so applied as to support the distended structures. Traction must now be sparingly used, plenty of time being allowed for the parts to yield; indeed, the pressure of the head on the perineum at this stage generally sets up sufficient reflex action to enable the uterus to expel its burden. Sometimes as the head is passing the vulva it is advisable to take off the forceps, a manipulation requiring some dexterity during the vehement uterine contractions. In cases where the head has not completed its rotation, the forceps has to be applied more or less in the opposite oblique diameter of the pelvis to that occupied by the head, the ear being still the guide, and rotation is to be encouraged by a slight turn of the wrist, so as to direct the face into the sacral concavity, the position of the handles showing when this is effected.

When the head is above the brim, the forceps is introduced solely with regard to the pelvic canal, and it is now that the second curve in the instrument becomes necessary. This operation is spoken of as

“applying the long forceps.” The blades are passed



Fig. 115.—INTRODUCTION OF THE SECOND BLADE OF THE LONG FORCEPS  
(After Barnes.)

in the manner first described, with, if possible, still more care and caution, since the head being so much



Fig. 116.—EXTRACTION BY THE LONG FORCEPS—THE HEAD BEING AT THE  
BRIM, TRACTION IS BACKWARDS. (After Barnes.)

farther out of reach, the danger and difficulty are

greater; moreover the maternal structures are more liable to receive injury, as the uterus itself is in contact with the blades of the instrument. The left hand must be well introduced, so as to guard the cervix from being torn or crushed, the operator making quite sure that the blades pass *within* the cervix. The



Fig. 117.—DELIVERY BY LONG FORCEPS IN CONTRACTION OF THE BRIM OF THE PELVIS.

caution previously given with regard to locking the instrument must be very rigorously observed, as incalculable mischief may be done by very slight movement of the handles, the motion being multiplied at the extreme end of the blades in direct proportion to their length.

The facility or otherwise of locking the blades after being properly introduced is an excellent guide as to the fitness of the case for delivery by the forceps. If, after a careful trial, the handles do not come into apposition, we may conclude that there is not room for the blades to occupy their proper position within the brim; if, on the contrary, they lock without difficulty, we are justified in attempting to deliver.

Traction must at first be made exclusively in the axis of the brim, by keeping the handles well against the perineum until the head descends into the cavity, when they must be gradually directed forwards.

It is advisable, when possible, to place the patient under the influence of chloroform, especially when the head is above the brim, as any involuntary movement on her part may produce serious results.

*The Vectis and Fillet.*—The vectis or lever and the fillet have been used as substitutes for the forceps. The vectis or lever resembles a single blade of the straight short forceps, the curve and expansion of the fenestrum, however, being much more abrupt. The action of the vectis is twofold—as a tractor and as a lever: as a tractor it is much inferior to the forceps, and as a lever it is capable of producing much mischief even in practised hands. The vectis, formerly a favourite instrument, now rarely finds a place in the obstetric bag, as its principal and most useful function, the rectification of unnatural presentations, and aiding rotation, can be compassed with a single blade of the forceps.

The fillet is also an instrument of ancient date, its use having been revived. It is constructed out of a slip of whalebone or other elastic material, which is bent into the form of a loop, and passed over the occiput or chin of the child. Its action is feeble, and if much force is used, not free from danger. Its



sole advantage is that it may be extemporaneously formed of materials to be found in almost every house, and so may prove serviceable should the practitioner be called upon unexpectedly to effect delivery when at a distance from home, and deprived of his more trustworthy instruments.

## CHAPTER XXVI.

## CRANIOTOMY, ETC.

THE object of this operation is to reduce the size of the foetal head by making an opening through which the brain may be evacuated, traction being afterwards made by means of various instruments constructed for the purpose. The profession of this country has the unenviable reputation of performing this operation more frequently than that of any other country in the world, in the proportion of about six or eight to one—a disparity partly owing to neglect of the timely use of version or the forceps, resulting in impaction or other condition only remediable by sacrificing the child; and partly to the difference in the relative value of foetal and maternal life held respectively in Roman Catholic and Protestant countries. The Roman Catholic Church stigmatises as mortal sin the destruction of infantile life for any cause; it has therefore been the custom on the Continent to resort to Cæsarian section in many cases which, in this country, would have been delivered by craniotomy. In a case of difficult labour, ere he takes up the perforator, the moral responsibility of the practitioner makes it an imperative duty to exhaust all the resources of his art, and, in cases of known pelvic deformity, to insist upon the induction of premature labour before the foetus is too fully developed to pass the portal alive. He should also, when possible,

adhere to the rule which forbids the performance of craniotomy without a consultation.

The causes which necessitate the performance of craniotomy are malformation of the pelvis and soft parts of the genital canal, including osseous, malignant, ovarian, and fibroid growths, cicatricial bands in the vagina, hydrocephalus or other abnormalities in the foetus; moreover, craniotomy may be needed in certain cases in which speedy delivery is required on behalf of the mother, as in convulsions, hæmorrhage, ruptured uterus, etc., but these incidents are generally treated by other means. In pelvic deformity the limit within which craniotomy is necessary is reached when the conjugate diameter is less than  $2\frac{1}{8}$  inches. It is generally admitted to be impossible for a living child at term to pass through a pelvis so far contracted. From  $2\frac{1}{8}$  inches to  $1\frac{3}{4}$  inch, craniotomy may be accepted as the proper method of delivery; but below  $1\frac{3}{4}$  inch, Cæsarian section must replace craniotomy.

The maternal mortality has been put down so high as one in every five cases; a proportion in excess of my own experience, which more nearly coincides with that of Dr. Meadows, who had only two deaths in sixteen cases.

The instruments used in the performance of craniotomy are the perforator, crotchet, vertebral hook, craniotomy forceps, and cephalotribe.

The *perforator*, the instrument for opening the foetal head, as its name indicates, is constructed in a variety of forms. Denman's perforator is inconvenient on account of its requiring the aid of an assistant to open the blades. Dr. Oldham has devised an excellent instrument, combining strength and rigidity with ease of manipulation; the cutting edges open by compressing the handles, so that the operator

himself has full command of its movements. Dr. Wiltshire has added to his perforator a guard, which protects the spear-head during introduction, and which can be withdrawn whilst the instrument is *in situ*. A very convenient form of perforator is shown at fig. 118. The handle and spear point form a straight line, the lever which separates the cutting edges projects some distance from it, so as to be out of the way of the hand whilst the point is being bored through the skull. Another advantage possessed by this instrument is the spring which closes the blade when the lever is released, and so facilitates the movements of the operator in making the crucial incision.



Fig. 118.  
PERFORATOR.

The *crotchet* (fig. 119) consists of a metallic stem either straight or curved, with a sharp hook at one end. The instrument is used by affixing the hook, guarded by the fingers of the left hand, to some portion of the cranium, and so obtaining a means of traction. The great disadvantage of the crotchet is its liability to slip and to injure either the hand of the operator or the soft structures of the mother.

Dr. Oldham's *vertebral hook* (fig. 120) has a long straight stem of slender proportions, devised for the purpose of extracting the head after its separation from the trunk in breech presentations. The hook is passed up the canal of the remaining vertebræ, there obtaining a hold.



Fig. 119.  
CROTCHET

The *craniotomy forceps* (fig. 121), consisting of two blades with long handles, is used for the same pur-

pose as the crotchet. One blade is inserted within the cranium, the other being external to it, so that on closure of the blades a portion of the skull is gripped between them. Sir J. Y. Simpson's craniotomy forceps is an excellent instrument and takes a tenacious hold.



Fig. 120.—DR. OLDHAM'S  
VERTEBRAL HOOK.



Fig. 121.—SIR JAMES SIMPSON'S  
CRANIOCLAST, OR CRANIO-  
TOMY FORCEPS.

The *cephalotribe* consists of two blades of much stronger build, intended to crush the bones at the base of the skull, and to afford a means of traction. The French pattern of cephalotribe, originally invented by Baudelocque, is a very weighty and powerful instru-

ment, the great length of the handles giving great leverage. Dr. J. Braxton Hicks' modification of Simpson's cephalotribe is a most convenient instrument; it



Fig. 122.—IMPROVED  
CEPHALOTRIBE.

consists of two strong blades having a slight curve, which can be applied separately, and afterwards locked, in the same manner as the ordinary forceps; then a screw is applied to the handles, which powerfully compresses the blades.<sup>1</sup> Dr. M. Duncan prefers the French model, in which he has made some improvements. The question of the pelvic curve in the cephalotribe is one on which opinions are divided. Dr. Kidd of Dublin argues that there should be no curve, as it interferes with the rotation of the instrument, and makes it more difficult to introduce. The French pattern has a considerable curve, which has been reduced by Sir J. Simpson and Dr. Hicks to one of about two inches, which, they contend, renders the instrument easier of introduction and firmer in grip, without interfering with its powers of rota-

tion. The propriety of the curve must be generally

<sup>1</sup> Messrs. Mayer and Meltzer have made for me an improved cephalotribe (fig. 122). It is light, weighing two pounds two and a quarter ounces, and combines power and compactness with efficiency. The screw, instead of being separate and removable, is united to the handle of one blade, along which it moves in a slot, so that it can be placed out of the way of the hands during the introduction of the blades. When the blades are in position, the screw can be instantly brought into action by one movement of the hand, thus obviating the necessity of an assistant. I have repeatedly tested this instrument, and found it very handy and efficient.

admitted when we consider that the cephalotribe is usually applied to the head above the brim, and that therefore the same rules should govern its construction which govern the construction of the long forceps.

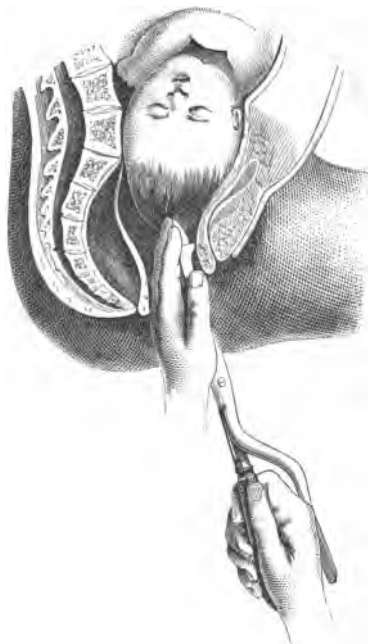


Fig. 123.—PERFORATION OF THE HEAD.

*The Performance of the Operation.*—The operation is divided into two stages, perforation and extraction; or, if the cephalotribe is used, a third stage of compression is added.

*Perforation.*—The two first fingers of the left hand are passed up the vagina, and the entire margin of the

os uteri is carefully distinguished. The perforator is then introduced with the right hand, and made to impinge on the most prominent part of the foetal skull, and over a parietal bone in preference to a suture. If the head is free, the fundus uteri should be carefully and firmly supported by an assistant, so as to steady the head and to prevent its receding from the perforator. The point of the instrument is then cautiously bored through the bone with a reciprocal motion of the wrist, then the blades of the instrument are thrust in as far as the shoulder stops, and widely opened. They are then closed, and turned the quarter of a revolution, and again opened, thus making a crucial incision. The closed blades should then be passed well into the cranium down to the foramen magnum, and moved about in all directions, in order to break up the cerebral tissues, especially the medulla oblongata, and so deprive the fœtus of life. Some operators prefer to use the crotchet for this purpose. Unless some urgent necessity demands immediate delivery, a pause of five or ten minutes may now be made, so as to enable the uterus to mould the collapsed head into the pelvis, and so to bring it more within reach.

*Extraction* with the crotchet is performed by passing the end of the instrument within the cranium, hooking it to some part and making traction, meanwhile carefully protecting the vagina with the left hand, in case the instrument should slip, or a piece of bone become suddenly detached. The crotchet should take hold of the skull in such manner as to bring it down edgewise. The central region must therefore be avoided, and endeavour made to attach the instrument inside to the lateral portions, or else externally to the orbit. If the instrument slips or brings away a portion of the cranium, fresh hold must be taken. During extraction the



scalp should be brought well over the jagged edges of the bones, to protect the soft parts of the mother.

The craniotomy forceps is a much safer instrument to use than the crotchet, and, as a rule, it is to be preferred. One blade is introduced into the opening made by the perforator, and the other passed outside the cranium, so as to grasp a portion of the bone and scalp, and traction is then made in the usual manner. Sometimes the whole of the calvarium becomes detached, piece by piece, each of which must be carefully removed, the vagina being protected from the sharp edges of the fractured bone either by the fingers or the blades of the craniotomy forceps. It is sometimes possible to draw down the remaining portions of the skull edgewise, by seizing and making traction at the orbit. Dr. B. Hicks recommends this to be done with a blunt hook having a stem made of soft iron, which can be bent so as to meet the requirements of each individual case.

The cephalotribe effects the same end by crushing the basilar portions of the skull, and so diminishing its bulk, the blades being passed over the head in the same manner as the long forceps, so as to include the base of the skull, which is then crushed. If the pelvic deformity is very great a second crushing may be necessary, in which case the instrument must be removed and reapplied as nearly as possible at right angles to the former position. Care must be taken to remove any fragments of bone detached by the action of the instrument; after which traction should be made, the flattened head being rotated if necessary, so as to be presented in the most favourable position to the contracted brim.

Sometimes it is necessary to perform craniotomy after version, the head being too large to follow the trunk. The perforator is applied behind the ear, and

considerably more force is needed to penetrate the cranium in this part, as the bones here are much thicker than at the vault.

Of the three modes of extraction after perforation, by the crotchet, craniotomy forceps, and cephalotribe,



Fig. 124.—DELIVERY BY THE CEPHALOTRIBE IN CONTRACTION OF THE BRIM OF THE PELVIS.

the last, in my opinion, is greatly to be preferred. Cases of extreme difficulty, which formerly occupied two or three hours in delivery, now require, with the cephalotribe, but one-fourth this time. No obstetric bag is complete without this instrument; indeed, it is surprising that an aid so efficient to delivery has taken so long to obtain its legitimate position in British obstetrics.

*Evisceration.*—This operation is performed in cases of transverse presentation, when delivery cannot be otherwise accomplished. The chest is opened with the perforator, and its contents broken up with the

crotchet and evacuated. If necessary, the diaphragm is ruptured, and the abdominal viscera removed ; traction is then made at the breech with the fingers or blunt hook, so as to imitate the mechanism of spontaneous expulsion.



Fig. 125.—FÆTUS AFTER EXTRACTION

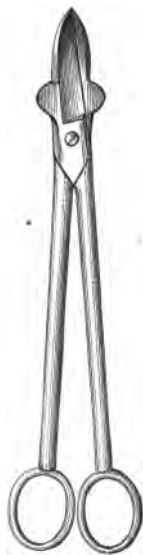


Fig. 126.—EMBRYOTOMY SCISSORS.  
WITH DR. HICKS' CEPHALOTRIBE.

*Decapitation* may be generally substituted for evisceration. Decapitation is performed either with Ramsbotham's cutting hook, or with a pair of long straight scissors having powerful blades. The cutting hook resembles in shape the ordinary blunt hook, with the inner curve brought to a sharp edge. It is passed up with its flat surface to the child's

body, the arm, if presenting, being previously drawn down, so as to bring the neck more within reach, and when sufficiently high the hook is turned partly round, so as to embrace the neck, which is then cut through with a kind of sawing motion. The operation requires considerable force, and the instrument must therefore be well guarded with the left hand, lest at the moment of severing the neck the hook should pene-



Fig. 127.—DECAPITATION OF FŒTUS WITH EMBRYOTOMY SCISSORS.

trate the vagina. An easier and safer way is to use the scissors, with which the neck can be gradually cut through from below upwards. When decapitation is effected, the trunk is drawn down by the arm without much difficulty, leaving the detached head within the uterus. If the uterus contracts well upon the head, the crotchet may be inserted into the mouth or Oldham's hook into the foramen magnum; or the

cephalotribe may be applied and the skull crushed and withdrawn. When the uterus, however, refuses to contract, and so steady the head, it is often a very awkward matter to get it away. The application of the crotchet becomes dangerous, from the head being liable to slip suddenly round when traction is applied. The best plan is to have the uterus well steadied by an assistant, and cautiously to apply the cephalotribe.

Dr. Barnes has devised a method of reducing the foetal head, in theory simple and efficacious, which, however, has not yet undergone adequate practical testing to establish it amongst obstetric operations. The instrument used is the *écraseur*, furnished with a loop of steel wire. After perforation, the crotchet is passed into the opening made by the perforator, and held by an assistant so as to steady the head: the wire loop, compressed by the fingers, is then passed over the crotchet to the right side of the os uteri, and is guided over the anterior part of the child's head, which is then separated by working the instrument. The segment after detachment is removed by the craniotomy forceps, which are applied to the remaining portion of the head, and then the foetus is extracted. In cases of extreme pelvic deformity a second or even third application of the *écraseur* may be required, with repeated manipulations to effect the evisceration of the thorax and abdomen.

## CHAPTER XXVII.

## CÆSARIAN SECTION OR HYSTEROTOMY.

THIS operation, the forlorn hope of the obstetric art, dates from the earliest times, and for centuries has been the theme of strenuous argument for and against. *Laudatur ab his, culpatur ab illis.* It has been eulogised in glowing strains as a means of salvation to mother and child; it has been anathematised in unmeasured terms as certain death to both. The Cæsarian section is indeed the most formidable of obstetric operations. Ascending in relative gravity, first we have the forceps, next version, then craniotomy, and finally the operation under discussion. It is of course wrong to resort to it so long as other and less objectionable means are available; but it is culpable to allow a patient to be lost for want of the timely performance of an operation which, though greatly to be dreaded, yet has saved many lives.

In order that Cæsarian section may not prove a forlorn hope, it should not be deferred until, as too often happens, the patient's powers are reduced to the lowest ebb. It is greatly to be feared that in many cases the operation has been performed as a sort of obstetric absolution, in deference to the rule that a woman in travail should not be allowed to die undelivered. The conditions which render the operation necessary are pelvic deformity, pelvic tumours, or any other absolute barrier to parturition. The

kind of pelvic distortion most frequently encountered in cases requiring Cæsarian section is that produced by osteomalacia. This disease, when far advanced, divides the brim into two parts, from collapse of the sacrum and iliac bones, and thus precludes any attempt at vaginal delivery; more rarely, rickets produces a degree of deformity sufficient to demand the operation. The rare form of spinal malposition known as spondylolisthesis may render it necessary. It may be required also in occlusion of the pelvic canal by osseous or malignant tumours, or when malignant disease of the lower segment of the uterus has rendered the cervix undilatable. Alonso reports an extraordinary case of Cæsarian operation for the extraction of a fœtus, which was retained in utero for twenty-two months through rigidity of the os.

Cæsarian section has been performed immediately after the death of the mother with the view of saving the infant's life, but unless the operation takes place within a quarter of an hour after death, it is not likely to be successful; the difficulty of obtaining surgical aid at the exact time of decease makes the post-mortem operation one of rare occurrence.

The degree of pelvic contraction which on the Continent is held to necessitate Cæsarian section is estimated at from 2 to  $2\frac{1}{2}$  inches; but in this country, with so much space at his command, no practitioner would be justified in resorting to this formidable operation. Delivery has been effected by craniotomy through an antero-posterior diameter of  $1\frac{1}{2}$  inch, or even less: it is a question, however, whether, when the space is so limited, the severe bruising which the maternal soft structures must necessarily undergo is not productive of as much danger as Cæsarian section. If the conjugate diameter of the brim exceeds  $1\frac{3}{4}$  inch without further obstruction lower down the

pelvic canal, craniotomy ought to have the preference; if the measurement is less, hysterotomy is the only alternative.

The maternal mortality is very great, but, as before pointed out, a large part of this is owing to delay in operating. In this country only about 15 per cent survive; but on the Continent, where the operation is not looked upon with such disfavour, and is consequently not delayed, the recoveries average about 57 per cent, this glaring discrepancy proving that by prompt measures the death-rate may be largely reduced. Our enlarged experience in abdominal surgery, derived of late years from the frequent successful performance of ovariectomy, cannot fail to aid us in the treatment of Cæsarian section, and tends to encourage the hope that the future percentage of deaths will place Cæsarian section in a far more favourable position than it at present occupies. The causes of death include shock to the system, hæmorrhage, and peritonitis. Shock is the inevitable result of an operation of this magnitude, and the question is—How to reduce the shock to the minimum? The answer is obvious—Operate before the patient has lost her reserve of nerve force, and give chloroform; or, if the risk of vomiting is dreaded, local anæsthesia may be substituted. Hæmorrhage, though often extremely copious, is not very frequently a direct cause of death; it may arise from two sources—the abdominal walls and the uterine and placental sinuses. If from the abdominal walls the arteries should be taken up as they are divided; if from the womb itself, nothing but celerity on the part of the operator, together with manual compression of the uterus after extraction, will check the flow. A large dose of ergot before operating might have some restraining effect. Peritonitis, including me-



tritis, a great source of danger, may supervene within twenty-four hours from the operation, or after an interval of several days. The exposure and handling of the peritoneum are theoretically sufficient to account for inflammation, but when in addition to this we consider the primary escape of blood and liquor amnii into its cavity, with the liability to after-oozing from the divided coats of the uterus, it becomes a matter of no surprise that inflammation after hysterotomy is of frequent occurrence. Here, however, ovariectomy affords an instructive lesson. In performing that operation I have frequently been compelled carefully to sponge out the peritoneal cavity after the accidental rupture of the cyst, and extravasation of its contents, a procedure taking up a considerable time, and which of necessity has involved much exposure and handling, yet the result has been favourable. I am inclined to think that the muscular coats of the uterus at term being in a state of incipient degeneration are consequently not in a good condition to take on the healing process; and that this state, coupled with exhaustion of the systemic powers, is to be taken as the special factors in the causation of asthenic inflammatory action. The maternal mortality appears to be greater in cases of osteomalacia than in rickets. The infantile mortality is greater than in natural labour, only about 60 per cent of the children being born alive. Dr. Radford, however, states the mortality to be only half per cent greater than in ordinary births.

*The Operation.*—The first point to consider is the period when the operation should be performed. Is it better to wait until the uterus has begun to act from physiological impulse, or to anticipate the action by artificial means? It is undoubtedly better to have

the womb in action before operating, in order that the os may be open ; but as uterine action may occur at an unexpected time when efficient assistance cannot be obtained, Barnes recommends the artificial induction of labour within the last fortnight of gestation. This as a matter of course can be done only in cases where the condition of the pelvis is known beforehand ; if the deformity is discovered only after the commencement of labour, all we can do is to definitely determine without loss of time whether the operation is necessary, and if so, forthwith to perform it. Winckel is of opinion that the end of the first stage is the best time to operate. Greenhalgh strongly urges its performance before the rupture of the membranes.

The chloroformed patient is placed on her back on a table, and her bladder emptied. It has been recommended to determine the position of the placenta by auscultation, but as the so-called placental bruit does not indicate the placental attachment with any certainty, the endeavour will most likely be futile ; and, indeed, if we know that the placenta is attached to the front wall of the uterus, we cannot alter the line of incision sufficiently to avoid it. An incision is now made along the linea alba, from just below the umbilicus, to within two inches of the pubis, and the tissues divided seriatim until the peritoneum is reached, when a small opening is made so as to admit one or two fingers of the left hand to act as a director for the knife. The peritoneum is then divided to the full extent of the primary incision, the abdominal walls being carefully supported by assistants on each side. The uterus is now opened parallel with the abdominal incision, avoiding the fundus and cervix where the circular fibres are most abundant, lest the wound should afterwards

gape. When the uterine cavity is reached, Winckel advises that an assistant should pass the fingers of each hand, the one to the top and the other to the bottom of the opening, and lift up the uterus so as to bring it into close contact with the abdominal walls, and thus, at the same time, prevent protrusion of the intestines, and escape of blood and liquor amnii into the peritoneal cavity. If the placenta lies immediately in front, the hand must be passed between it and the uterine wall until the membranes are reached, which must then be ruptured and the child extracted, care being taken that the uterus does not by a sudden contraction close upon the head and grasp it so firmly as to necessitate a second incision ere it can be liberated; as this accident has happened, it is well to bear in mind that, in some cases, there is a special irritability of the uterus exciting it to sudden and powerful contraction. The placenta is then removed, when, in favourable cases, the uterus contracts, checking hæmorrhage and closing the wound. I have seen three cases of Cæsarian section, and in two of them I myself operated. In two of these operations we experienced considerable difficulty in inducing uterine contraction, but at last succeeded by the aid of Faradisation, and this agent I strongly recommend in similar cases. Some operators apply sutures to assist in keeping the edges of the wound in apposition. Either silk or silver wire may be used. If silk is used with the uninterrupted suture, one end should be passed through the os uteri into the vagina, so that the silk may be withdrawn when union is supposed to have taken place. Winckel, who has had great experience in this operation, never uses sutures. When the uterus is well contracted, two things yet remain to be done before closing the abdominal wound: first, by means of soft sponges

wrung out of warm water, the peritoneal cavity should be carefully freed from the blood or liquor amnii which may have escaped into it; and second, it should be ascertained that the os uteri is open, and any clots, likely to prevent or retard the exit of the lochial discharge, should be cleared away. All bleeding being stopped, the incision in the abdominal parietes is closed with interrupted sutures passed through the entire structures so as to bring the divided edges of the peritoneum into apposition. The wound is then covered with a light dressing, the catheter passed when required for the first few days, and the sutures removed on the fourth or fifth day unless there is great tympanitic distension, in which case they must be allowed to remain some days longer. The general treatment is regulated by the exigencies of each case.

The great fatality attending the performance of Cæsarian section has led to the suggestion that the uterus, after being emptied by abdominal section, should be removed. The risk of leaving in the abdomen a wounded organ with a communication between its cavity and that of the peritoneum is thus avoided. The merit of first suggesting the operation is due to Dr. Cavallini (1769). Dr. Blundell (1823-8) performed a series of comparative experiments on pregnant rabbits, in some performing ordinary Cæsarian section, in others removing the uterus as a subsequent step, with results in favour of the latter operation. In 1869 Dr. Hover of Boston first performed the operation on a woman, on account of obstruction to delivery caused by a uterine fibroid; the patient died. In 1874 Professor Porro of Pavia repeated the experiments with rabbits without knowledge of Blundell's prior observations, or those of Dr. Fogliata of Pisa, which were also made in 1874. To Dr. Porro belongs the credit of establishing the

operation—now known by his name—on a practical footing. The earlier steps of the operation are identical with ordinary Cæsarian section. After removal of the foetus and placenta, the uterus is lifted out of the abdomen and secured just above the os internum either with ligatures, wire girdle (*serre-nœud* of Cintrat), chain écraseur, or clamp. The organ is then ablated above the constriction, the stump being left in the abdominal wound, as in cases of ovariectomy, where the pedicle is not returned into the abdomen. The operation is performed with antiseptic precautions, and a drainage-tube is placed in the pelvic cavity. The operation has been modified by making the abdominal incision large enough to allow the uterus to be turned out of the abdomen; the cervix is then constricted with cord or wire, the uterus opened, the child removed, and the organ afterwards ablated as above described. The object of this modification is to prevent any blood or other fluid finding its way into the abdominal cavity. This method of performing the operation materially increases the risk to both mother and child. Dr. Harris of Philadelphia, who has tabulated thirty-six cases of Porro's operation, considers the operation can lay claim to two advantages over ordinary Cæsarian section.

1. The wound originally within the abdomen is treated virtually without the body, where it can be observed and dressed to the best advantage.

2. There is no bleeding or gaping uterine wound; no lochial discharge; no escape of fluids into the abdominal cavity from the uterus; and no uterine sinuses to absorb noxious matters, set up phlebitis or metritis. The fact that the operation unsexes the patient has been advanced as an objection to its performance; but, considering the nature of the cases

which demand the operation, I should look upon this result, on the contrary, as a distinct gain. Dr. Godson has also tabulated 129 cases of true Porro operation, including one of his own, the only successful case to both mother and child which has yet occurred in this country.

*Gastro-Elytrotomy*, a substitute for Cæsarian section, was proposed some years ago, but received little attention until Professor Thomas, of New York, quite recently revived the operation under the name *Laparo-Elytrotomy*, from *λαπάρα*, the flank, *ελυτρον*, the vagina, and *τομή*, a cut. In this operation the peritoneum is not opened, and consequently the danger of peritonitis, one of the great evils of Cæsarian section, is considerably reduced. The operation is thus described by Dr. Thomas: The patient having been etherised is placed upon a firm table, and the os fully dilated with Barnes' bags. An incision down to the peritoneum is made from the symphysis pubis to the anterior superior spine of the ilium; the peritoneum is lifted up by the fingers, or by metallic retractors, until the junction of the uterus with the vagina is reached. By means of a metallic sound passed through the vulva the vagina is made to protrude in the wound, and is divided at its juncture with the cervix, which is then drawn into the iliac fossa. The child is now extracted through the dilated os by version, the placenta removed, and the uterus made to contract firmly. The iliac fossa is then washed out by a stream of warm water introduced through the abdominal wound and allowed to escape through the vagina, after which the abdominal wound is closed by interrupted sutures. The vagina is syringed out every five hours with carbolised water, the nozzle of the syringe being carried through the vaginal opening, and the fluid forced through that in

the abdomen. In this operation the great danger to be apprehended is hæmorrhage from the vaginal arteries, though it has not occurred in the cases hitherto operated upon. Dr. Thomas thinks that hæmorrhage could be controlled by means of ligatures, the actual cautery, or styptics.

*Abdominal Section, or Gastrotomy*, after rupture of the uterus, is performed in the same manner as Cæsarian section, except, of course, so far as the uterine incision is concerned.

*Symphyseotomy*.—About the middle of the last century, Sigault, a French student of medicine, proposed an operation thus named as a substitute for Cæsarian section. It now no longer ranks amongst obstetric operations; there is therefore no need to do more than explain that it consisted in bisecting the symphysis pubis in order to allow the innominate bones to separate, so as to increase the dimensions of the pelvic canal. Now, as the sacro-iliac synchondrosis is not a movable joint, it is plain that very little separation of the bones can take place without rupture of the sacro-iliac ligaments, and moreover, that any increase in the pelvic diameters thus obtained is principally confined to the oblique, whereas the antero-posterior diameter, which is generally the seat of obstruction, undergoes scarcely any enlargement. For a time the operation excited considerable attention in Paris, but, with the exception of an attempt to revive it in another form, it has passed into well-merited oblivion.

## CHAPTER XXVIII.

## PUERPERAL CONVULSIONS.

UNDER the generic title Puerperal Convulsions, several distinct forms of convulsive seizure are included, which, by different authorities, have been classified in various ways. The most simple plan, I think, is to set aside attacks of a hysterical and an apoplectic nature, and then to consider (*a*) puerperal convulsions proper without renal complication; and (*b*) convulsions associated with albuminuria from confirmed Bright's disease, or from passive congestion of the kidneys, resulting solely from the gravid state.

*Hysterical Convulsions*, as may be readily supposed, are confined to females of highly nervous and sensitive temperament. The attacks usually occur either during gestation or after parturition, rarely during labour, and are excited mainly by mental distress or violent emotion.

The symptoms are those of ordinary hysteria—premonitory fits of sighing, sobbing, and laughing, followed by a convulsive seizure, easily discriminated, however, from true puerperal convulsion by the absence of spasm of the glottis and frothing from the mouth. Sudden affusion of cold water cuts short the attack, and thus completes the diagnosis. If the attack comes on during labour, the patient evinces the utmost repugnance to vaginal examinations, and will sometimes stretch herself at full length, with her



legs and nates firmly compressed, and her whole body in a state of opisthotonos, so as to render investigation almost impossible, and if the attendant does manage to reach the vagina, the presence of the hand brings on another convulsion. At other times she will violently jerk herself about the bed, complaining loudly and bitterly of her sufferings.

Attention to the state of the stomach and bowels, the taking of regular exercise with carefully regulated diet, and the avoidance of any mental agitation, will tend to prevent an attack. If the fit occurs during labour, cold water, and a certain firmness of manner on the part of the attendant, will go a long way towards subduing it.

*Apoplectic Convulsions.*—The attack usually comes on during labour, and is generally the result of violent muscular exertion and prolonged retention of the breath during the later part of the expulsive stage, producing either congestion or effusion, similar to ordinary apoplexy.

*Symptoms.*—Pain and excessive throbbing in the head, injection of the conjunctivæ, followed by a convulsive seizure which leaves the patient insensible, with fixed pupils (either contracted or dilated), stertorous breathing, and a slow, laboured pulse. If the attack is slight (congestive), consciousness in a short time returns, the patient simultaneously regaining the full possession of her bodily movements; if the attack is more severe, paralysis remains after return of consciousness. In fatal cases the coma deepens, death coming on without any return to consciousness.

*Treatment.*—Cold applications to the head, vesication of the neck, and sharp purgatives, as pulvis jalapæ co., croton oil, or elaterium. If the congestion is very marked, venesection will afford immediate relief, and in appropriate cases should be promptly resorted to,

in order if possible to reduce the pressure of the vascular system before the occurrence of effusion. Delivery should be effected as speedily as possible, artificial assistance being rendered if necessary.

*Puerperal Convulsions* of the epileptiform class, which supervene without renal mischief, are the result of disturbance of the nervi-motor functions, originating in an altered condition of the nervous, genital, or alimentary systems, and are sometimes due to certain forms of toxæmia, chiefly that produced by carbonic acid.

Dr. Tyler Smith divided puerperal convulsions into those of centric and eccentric origin; the centric including disorders of the cerebro-spinal centres resulting from hyperæmia, anæmia, and the presence of certain poisonous elements in the blood, together with causes of a purely psychical derivation, either prolonged, as in the case of mental depression produced in an unmarried woman through a keen sense of the degradation involved in her sexual lapse, or immediate, as from the receipt of unexpected news—as, for example, the loss or unlooked-for return of husband or other dear friend. Hyperæmia of the cerebral or spinal centres or of their meninges, produces convulsions by mechanical pressure, which, if confined to the cerebrum, induces a tendency to coma; if to the medulla oblongata, the tendency is to convulsions. Extreme anæmia likewise produces convulsions by disturbing the balance of pressure in the nervous centres. Dr. Angus Macdonald, in his monograph on Puerperal Eclampsia, says:—"It is highly probable that in cases of puerperal eclampsia in which the kidneys are perfectly sound, irritation originating in the uterus and terminating in an eclamptic seizure, acts by irritating reflexly the vaso-motor centre in the medulla oblongata, and thus inducing sudden

anæmia." Convulsions from anæmia may be witnessed in cases of sudden and violent bleeding. I have seen them occur during the last stage of violent and persistent hæmatemesis. Further, the pressure of the gravid uterus on the diaphragm, by impeding respiration, may interfere with the due elimination of carbon from the blood, and another source of impurity is derived from the excrementitious matter of the fœtus, which has to be eliminated through the maternal system; the presence in the blood of the elements of bile also exercises a morbid influence upon the nervous centres, especially upon the spinal cord.

Amongst the eccentric influences are those reflected from the genital system, a transient convulsive movement not unfrequently occurring at the moment the head passes through the os uteri into the vagina, or when it emerges through the vulva. In ordinary cases this amounts merely to a slight rigor, but, if there is any excess of nervous irritability, a more or less severe convulsion ensues; and when this peculiar irritability exists, a recurrence of the attack will generally take place on the introduction of the hand into the vagina, especially if any attempt is made to dilate the os uteri, or to detach the placenta manually.

Irritation from the alimentary canal may proceed from fæcal accumulation, produced through pressure of the uterus on the bowels interfering with their action. Vesical calculi and retention of urine have been known to act as excitors of reflex action.

*Symptoms.*—Puerperal convulsions generally come on either immediately before or during the progress of labour. The attack may be preceded by premonitory signs, such as restlessness, giddiness, throbbing of the temples, or ringing in the ears. The crisis, perhaps, occurs at the acme of a pain; for a moment

the eyes are fixed and the body rigid. The face is the starting-point of muscular contraction, the eyes being upturned violently, exhibiting the whites only, with one corner of the mouth drawn to the side. The spasmodic movements rapidly extend to the trunk and extremities; the neck swells, its vessels become prominent, the larynx is spasmodically closed, and the face is congested and of a purple colour. This condition lasts fifteen or twenty seconds, and is followed by clonic convulsions which contort the whole frame; frothy mucus, sometimes tinged with blood from the bitten tongue, oozes from the mouth; the circulation is impeded by spasm of the diaphragm and thorax, so that attempts at expiration produce a peculiar hissing sound, the unoxygenised blood imparting a dusky hue to the skin, especially to that of the extremities; the eyelids quiver, the eyeballs are contorted in a horrible manner, and the patient is now totally insensible to external impressions. The spastic contractions continue for two or three minutes, or more, according to the severity of the attack, and, as they subside, respiration becomes more regular, the swelling of the neck and face passes away, the surface gradually assumes its natural colour, leaving a period of coma varying in duration from a few seconds to several hours. The pulse at first is full and bounding, but during the convulsions it becomes quick and feeble.

A very intense attack may destroy the patient during the condition of tonic spasm, or the comatose state may persist with repeated return of the convulsive movements, which either subside after a time or cease only with the death of the sufferer. When the patient recovers she is totally oblivious of what has happened, and recognises the results only in the shape of muscular pain, with general weakness and fatigue.

As a rule, an attack does not influence the course of labour, but in some instances it accelerates delivery in a marked degree.

*Treatment.*—The occurrence of premonitory symptoms warns us to trace out the cause, and, if possible, to remove it. An overloaded stomach or rectum must be relieved by emetics, purgatives, or enemata; retention of urine by the catheter; mammary irritation by soothing applications, and the subcutaneous injection of morphia.

During the attack it is needful to take the precautions observed in ordinary epileptic seizures, as placing a piece of cork between the teeth, and as far as possible restraining the patient from injuring herself by violent muscular movements, and to counteract the nervous excitation by fitting means. Indiscriminate bleeding was the panacea of the fathers of physic, as the attack was invariably assumed to be congestive in character; at the present day there is some danger of veering to the opposite extreme, and of neglecting venesection altogether. In certain cases, where the plethoric habit of the patient shows itself in suffusion of the eyes, with other signs of cerebral congestion, abstraction of blood produces a marked and immediate improvement. The question of depletion, therefore, ought not to be dismissed without due consideration. A free and immediate evacuation of the bowels by the aid of some brisk cathartic, as pulvis jalapæ co. with or without calomel, or elaterium or croton oil, if the patient is insensible, will usually produce a good effect.

The plan of general treatment most in accordance with modern views is to subdue the nervous excitation by means of anodynes and anæsthetics. Opium has been largely used, but of late years chloroform and its congener chloral hydrate have supplanted

it. No remedy produces effects so immediate in subduing convulsions as chloroform administered when the attack seems imminent. It will generally cut the fit short, or at least mitigate its violence, in a surprising manner. During the extreme difficulty in respiration the inhalation should be stopped, to be afterwards renewed when spasm has ceased, and the effects of the drug may, if necessary, be kept up for a prolonged period. Chloral hydrate may be advantageously employed to supplement the effects of chloroform, and so to ward off impending danger. Chloral should be given somewhat freely—thirty or forty grains at intervals—until the desired effect is produced, and if administration by the mouth is difficult, it may be given in the form of an enema. In these cases Dr. Fordyce Barker prefers the hypodermic injection of morphia to chloral.

The application of cold to the head is often of great service; it should be continuously applied, otherwise it will tend to counteract the effect of the anæsthetic.

To epitomise the treatment: After attending to any special condition, as extreme cephalic congestion or alvine constipation, place the patient completely under the influence of an anæsthetic, to the extent of entirely suspending voluntary muscular movement, and so to remove pressure from the vascular system. If necessary, the anæsthetic condition may be maintained for hours until delivery is accomplished or the nerve-storm has passed away.

It now remains to consider what steps ought to be taken with regard to the contents of the uterus. Here again a radical change in treatment has taken place; the rule formerly acted upon was simply to hasten delivery in every case, but it is now deemed better practice not to interfere without special indi-

cations. If the patient gets rapidly exhausted, and the attack undergoes no diminution in intensity, steps must be judiciously taken to promote delivery. The os usually dilates readily under the influence of the chloral; if, however, it proves obstinate, one of Barnes' bags may be used, and when the os is fully dilated the membranes should be ruptured. If artificial delivery is necessary, the forceps is to be preferred to version (in the absence of any special reason in its favour), as the passing of the blades causes less irritation to the uterus than the introduction of the hand or arm; if version is necessary, the bi-polar method may be tried. Dr. Fordyce Barker thus sums up the position:—"Whenever delivery by art can be effected with less irritation than would be produced by the continuance of the child in the parturient canal, it should be resorted to."

Convulsions after delivery must be treated on the same general principles.

*Puerperal Convulsions associated with Albuminuria.*—

The presence of albumen in the urine of pregnant women has of late years been recognised as a very common occurrence. It may exist in quantity so small as to produce no apparent effect on the system, and reveal itself only to the most delicate chemical tests, or it may exist to such an extent as to cause the urine to solidify on the application of heat, and give rise to some of the most fatal diseases of pregnancy.

Puerperal albuminuria manifests itself under two conditions, viz. Bright's disease and passive congestion. Bright's disease may be a mere coincidence, since impregnation may occur in a female who is already suffering from the disease, or the disease itself may come on from independent causes during the gravid state. The etiology of passive conges-

tion resultant upon pregnancy has not yet been clearly set forth. It has been proved experimentally that pressure on the renal veins will produce albuminuria by causing distension of the renal capillaries, and so favouring transudation of the fluid constituents of the blood through their walls. This theory has been applied to the albuminuria of pregnancy by supposing that the gravid uterus compresses the emulgent veins of the kidneys; and in support of this view it is stated that albuminuria is more frequent in primiparæ than multiparæ, on account of the less yielding condition of the abdominal walls, which thus exercise more pressure on the uterus. Dr. Brown-Séquard placed a patient with albuminuria in such a position that direct pressure of the uterus was taken off the renal veins, and after a time the albuminuria disappeared, but on the patient resuming the ordinary attitude the albumen returned.

The fact that albuminuria usually occurs towards the end of gestation, when the uterus is fully developed, tends to corroborate this view. Cases have been also observed where the urine was free from albumen up to the end of gestation, but that after delivery it became present in abundance, thought to be due to muscular contraction compressing the renal veins.

On the other hand, we have immunity from albuminuria not only in the majority of pregnant women, but in cases of ovarian and other abdominal tumours, where, to say the least, the pressure equals that which exists in pregnancy.

The position of the renal veins also affords strong evidence against the theory of compression. Heller traced the course of the left renal vein—the one most liable to compression—and found in the great majority of cases that it crossed the vertebral column



immediately above the second lumbar vertebra. Bartells points out that it would necessitate the bending back of the uterus at a considerable angle, just above the pelvic inlet, to enable it to touch with its posterior wall the body of the second lumbar vertebra, and that such a flexion is rendered impossible by the attachments of the round ligament. In autopsies made in the bodies of women far advanced in pregnancy, Bartells found that, at the level of the second lumbar vertebra, a considerable space exists between the uterus and the vertebral column. The pathological changes in the kidneys are also of a kind which do not result from venous congestion, but which agree with the changes produced by parenchymatous nephritis. The kidneys are larger than normal from increase in the cortical portion, which is anæmic, pale in colour, and soft in texture. The pyramidal portion is highly congested and of a deep red colour, affording a marked contrast with the cortex. The capsule is tightly stretched and peels off readily. The left kidney never suffers singly, nor is it affected to a greater extent than the right, as it probably would be were the disease produced by mechanical compression of the renal veins. The rapid disappearance of albumen from the urine after delivery has been adduced in favour of the causation of the disease by compression of the renal veins. The striking alteration of the vascular system after labour is, however, quite sufficient to account for a speedy change in the state of the kidneys. Moreover, the return of the kidneys to the normal performance of their functions is not always so immediate as has been stated; I have frequently found albumen many weeks, or even months, after labour. There is a marked tendency to nephritis in multiple pregnancy, so much so, that Litzmann utilises

this fact for diagnostic purposes, and decides against the probability of twin gestation when the urine is free from albumen. This tendency to nephritis in multiple pregnancy appears to favour the theory of venous compression, but Litzmann states that an equal distension of the uterus from hydramnios is unattended by albuminuria; we are therefore compelled to admit that there must be some cause for nephritis in multiple pregnancy other than excessive bulk of the uterus. Although the parenchymatous nephritis of pregnancy does not produce the amount of organic change in the kidneys that is frequently met with in cases of scarlatinal and other analogous forms of the disease, the resultant uræmic symptoms are much more common and more violent. Labour is doubtless a considerable factor in the production of eclampsia, as will be presently shown, but there still remains a marked predisposition to eclampsia, both before and after labour, in pregnant women affected with nephritis. This has been attributed to a watery condition of the blood, and to the retention in it of effete matters; there is, however, much to be explained about the entire subject. I agree with Bartells in thinking that no satisfactory explanation of the causation of the nephritis of pregnancy has, as yet, been propounded.

When the connection between albuminuria and convulsions was first discovered, it was inferred that their mutual relation was simply that of cause and effect. According to Braun, convulsions are due to the presence of urea in the blood, which the disordered kidneys fail to eliminate, the albuminuria indicating this uræmic condition. Further investigations, however, failed to prove the presence of urea in the blood of patients suffering from albuminuria, and Frerichs then propounded the theory that urea be-

comes decomposed into carbonate of ammonia, which is the actual excitor of the nervous centres. Still more recent experiments tend to show that the proximate products of the degeneration of the bodily elements (creatine, etc.), previous to their further decomposition into urea, are the active morbid elements in the blood, and that the compression of the ureters by the gravid uterus may cause reabsorption of the urinary constituents after their removal from the circulation by the normal action of the kidneys. There is reason to believe that in many instances, so far from albuminuria being the cause of convulsions, the converse is really the case, the convulsions giving rise to, or at any rate being immediately followed by, albuminuria; for cases have been recorded where no trace of albumen could be detected in the urine prior to the seizure, but after the convulsion both albumen and casts of the uriniferous tubules were present, owing probably to the spastic contractions of the abdominal muscles producing pressure on the renal veins, which had hitherto escaped compression, precisely as happens in albuminuria produced by labour. Dr. Braxton Hicks thinks that in such cases, if albuminuria be indicative of uræmia, the convulsions are either the cause of the nephritis, or that both are due to the same cause.

Traube and Rosenstein hold a theory entirely different from any of those previously mentioned with regard to the causation of puerperal convulsions. They do not attribute the convulsions to toxic influences in the blood, but to an anæmic condition of the cerebral vessels. They say that the abstraction of albumen from the blood, and consequent hydræmia, combined with a coincident hypertrophy of the left cardiac ventricle, cause an increased pressure in the arterial system, which leads to hyperæmia of the

brain; the condition of the blood being such as to favour exosmosis, œdema of the cerebral tissues ensues, which reacts mechanically by pressing on the intercranial vessels, producing anæmia, and consequently convulsions. The watery condition of the blood which exists in the gravid state, uncomplicated with albuminuria, may of itself lead to a similar anæmic condition of the cerebral vessels. The anæmic and œdematous condition of the cerebral tissues, which is frequently found in post-mortem examination of fatal cases of puerperal convulsions, tends to support this theory.

Convulsions occur for the most part at the beginning, or during the course of labour. According to Braun the proportion is 24 per cent before, 52 per cent during, and 24 per cent after labour. Wieger in 455 cases gives 109 before, 236 during, and 110 after labour. Von Mieczkowski out of 50 cases found that convulsions occurred four times before, and six times after labour. With regard to the relative frequency of convulsions in primiparæ and multiparæ, Scanzoni states that of 296 cases 235 were primiparæ. Simon Thomas, of Leyden, gives the proportion as 1 in 234 primiparæ, and only 1 in 4000 multiparæ. Every pregnant woman suffering from albuminuria does not become eclamptic. Devilliers, Regnauld, Blot, and Mayer give the proportion as 25 per cent. Rosenstein saw three women with Bright's disease and Frankenhäuser six in whom the albuminuria was attended by previous heart disease, and all escaped convulsions and were safely delivered.<sup>1</sup>

The initiatory symptoms of uræmia are lassitude and drowsiness, with headache, usually of an obstinate dull character, impairment of vision, amounting often

<sup>1</sup> Vide *Leçons de Clinique Médicale par S. Jaccoud*. Paris, 1873.

to total loss of sight, a uræmic symptom not often met with apart from pregnancy. Less frequently the hearing is affected; puffiness of the face, extremities, and especially of the vulva, is usually present, and pressure on the pelvic veins produces œdema of the lower extremities. Litzmann directs attention to a remarkable retardation in the pulse rate immediately before an eclamptic seizure. In albuminuria of some standing the stomach and bowels participate in the general derangement; vomiting and diarrhoea supervene, the ejected matters containing ammonia either free or combined. The urine is usually under the normal amount, the specific gravity varying with the quantity secreted from 1010 to 1025, the usual tests showing the presence of albumen in greater or lesser quantities, casts, epithelium, and amorphous débris. Robin states that the albumen of passive renal congestion differs in its chemical characters from that of chronic Bright's disease—the former producing no reaction with oxide of copper, whilst the latter gives a reddish-violet colour with flocculent black precipitate. This observation, if confirmed by future experiments, may possibly afford valuable aid in the diagnosis of obscure cases.

Independently of its common concomitant, convulsions, albuminuria is not unfrequently a cause of abortion, and the impoverished condition of the blood renders the patient liable to become a prey to the various disorders common to the puerperal state. On the other hand, cases are by no means uncommon where copious albuminuria is attended with no untoward symptoms. I may here mention the striking case of a lady, whom I attended some time ago during the later period of her pregnancy, who was the subject of albuminuria, which continued after delivery until she again became pregnant after a lapse of ten

months, and ceased only on the birth of the second child. Yet during the whole of this time her general health remained good; nothing but the chemical reaction of the urine and more or less oedema of the lower extremities indicating her actual state.

If the albuminuria leads to uræmic convulsions, the attack may or may not be preceded by some of the premonitory symptoms just enumerated. The seizure takes precisely the same form as those which have been previously described as resulting from reflex and direct excitation of the nervous centres uncomplicated with renal mischief.

*Treatment.*—The occurrence of any suspicious symptoms during pregnancy makes it the practitioner's duty to examine the urine at short intervals to satisfy himself as to the presence or absence of albumen. The examination should be carefully made, as the detection of the first on-coming of the disorder enables us to combat it with more chance of success; therefore the testing should be so performed as to reveal the slightest trace of albumen, and so put us on our guard whilst the mischief is in the incipient stage. The albuminuria of pregnancy is rarely got rid of previous to parturition, but certain indications must nevertheless be attended to. If the urine is scanty and high-coloured, dry cupping over the loins, with administration of acetate of potash, infusion or tincture of digitalis, and Seltzer or Vichy water, will prove beneficial; the bowels should be acted upon by saline purgatives, as the bitartrate of potash or the effervescing citrate of magnesia, care being taken not to give them too persistently. The impoverished blood should be enriched by generous diet, and by prescribing some of the preparations of iron—the tincture of the perchloride or the acetate is most to be relied upon, and chlorate of potash is

a useful adjunct. If the patient seems unlikely to survive to the full period of gestation, the question of inducing premature labour must be considered. This last resource should by no means be adopted unless the patient is actually in peril of her life; but if the operation is deemed necessary, it must not be deferred until it is too late.

The treatment during an attack is to be conducted upon the principles already laid down when speaking of non-uræmic convulsions.

The death-rate of puerperal convulsions has greatly decreased since the administration of anæsthetics has become the accepted mode of treatment. Dr. Fordyce Barker gives 32 as the death percentage of all the cases he could collect prior to 1855, whereas the total ratio is a little over 14 per cent in the cases he has seen since 1855.

## CHAPTER XXIX.

## PUERPERAL MANIA.

UNDER this head it has been customary to include three distinct forms of insanity :—

1. Insanity of pregnancy.
2. Frenzy of parturition.
3. { a. Puerperal mania, and  
b. Puerperal melancholia.  
c. Insanity of lactation.

With regard to the relative proportion of the three varieties, Dr. Tuke gives the following results deduced from 155 cases :—

Insanity of pregnancy . . .	18·06 per cent.
Puerperal mania . . .	47·09 „
Puerperal melancholia . . .	34·08 „

*The Insanity of Pregnancy* is almost always of the melancholic variety, and usually manifests itself in the third, fifth, or seventh month, hereditary insanity, in the great majority of cases, being the predisposing cause. The minor forms, not unfrequently met with in pregnant females, may be traced in perversion of the appetite and desires, the uncertainty and irritability of temper, and in cases more developed, a great tendency to the suicidal impulse. There is a proneness to re-development of the mental disorder after parturition. The treatment of this form of insanity must be mainly confined to moral means.



*The Frenzy of Parturition* occurs when the os uteri or vulva is distended to the utmost by the passage of the child's head; it is transient, and is merely the result of violent agony temporarily disturbing the balance of reason. All that is generally required in the way of treatment is to restrain the patient until the paroxysm passes away; but if time permits and further means are needed, the administration of chloroform is the most effective remedy.

*Puerperal Mania proper.*—This, the most frequent form of puerperal insanity, usually commences about the first or second week after parturition; in some instances it comes on almost immediately after delivery, but beyond the second week it rarely occurs. Out of 73 cases observed by Dr. Batty Tuke in the Royal Edinburgh Hospital 20 showed signs of insanity from the first to the fifth day after labour, 36 from the fifth to the fourteenth day, and 10 or 11 from the fifteenth to the sixtieth day. Dr. Burrows found the third and fourth days critical periods. After the second week the percentage of cases attacked at any given period is in inverse ratio to the length of time which has elapsed between the labour and the onset of the disease. Primiparæ are more liable to attacks than multiparæ; age is also a causal factor: between the ages of 30 and 40 years is the most dangerous period. When women become pregnant for the first time between these ages they are peculiarly liable to puerperal insanity. A long and difficult parturition, with excessive hæmorrhage, has a direct influence in the causation of puerperal mania. Hereditary influence, as before stated, is a powerful predisposing cause. Anxiety or emotion is a very frequent excitant of this disorder, hospital practice showing a largely increased proportion of cases in time of war or famine. Again, unmarried women, deserted by their seducers,

afford another example. Hysterical subjects and women of a highly intellectual type are liable to it. Debility, induced through over-lactation or rapidly recurring pregnancies, is another predisposing cause. It is occasionally coincident with inflammation of the peritoneum or pelvic organs, and may depend upon functional derangement of the stomach and bowels. Sir J. Simpson sought to connect puerperal mania with albuminuria, but later researches have not established this interdependence.

*The insanity of lactation* is usually restricted to a period commencing two months after labour. This form of insanity is far less frequent than ordinary puerperal insanity, being only from 3 to 5 per cent of the puerperal form. The cause is prolonged lactation, inducing anæmia and exhaustion. Dr. Batty Tuke shows that the greatest number of cases occur in the latter months of lactation; of 54 cases 33 occurred after the sixth month. The symptoms are usually of the melancholic type, only one-fourth of the cases assume the character of mania.

*Symptoms.*—The first symptom usually noticed is a change in the patient's manner; she becomes either exceedingly loquacious or very taciturn, falls into fits of laughing or crying without apparent cause, and often presents a perturbed expression of countenance and a hurried, agitated manner, resembling that of incipient delirium tremens. The next thing to attract attention is the perversion of the moral feelings; she takes a strong dislike to those nearest and dearest to her, the husband and child being held in special detestation, the patient often going so far as to threaten or to attempt the life of her infant. Indeed, cases occur from time to time, when, owing to want of proper restraint, she succeeds in carrying her morbid impulse into effect. As the symptoms increase

in intensity the patient becomes irritable and obstinate, flying into a violent passion under the least provocation, or even without any obvious cause, her actions become outrageous, and her language vociferous, fragmentary, and incoherent. A strange characteristic in these cases, showing the total subversion of the feelings, is the tendency, even on the part of refined women, to profanity and obscenity of language and gestures; there is also a great proneness to the suicidal impulse, which, however, is but transient. Dr. Macdonald observes that: "In the acute form of mania which succeeds parturition we observe an intensity of mental excitement, an excessive incoherence, a degree of fever, and, above all, a disposition to mingle obscene words with broken sentences—things which are rarely noticed under other circumstances. It is true that in mania modest women use words which in health are never permitted to issue from their lips; but in puerperal insanity this is so common an occurrence, and is done in so gross a manner that it early struck me as characteristic." Dr. Savage also states that he has several times judged a case of insanity to be puerperal from the mincing gait and lascivious looks of the patient. During all this mental and physical excitement the pulse is rapid and thready, the eyes are unnaturally brilliant, the face pallid, pinched, bathed in a clammy sweat, and the patient presents a collapsed shrunken appearance, strangely at variance with the symptoms.

*Prognosis.*—Puerperal mania, of all forms of insanity, is the most curable; as a rule it subsides under treatment in from one to two weeks, more or less mental debility and tendency to aberration of temper frequently remaining for some time. From 70 to 80 per cent recover. Dr. Webster states that of every five cases of puerperal insanity three may confidently

be expected to recover within the year. Dr. Savage shows by statistics that in puerperal mania the greater number of cases recover in the third month; in puerperal melancholia the greater number recover in the sixth month. If the disease is prolonged over several months, the chance of recovery becomes more remote, and sometimes the case assumes the permanent melancholic form. Death rarely takes place from uncomplicated mania. Cases in which death *does* occur are almost always associated with pelvic cellulitis, pneumonia, phrenitis, or some other lesion. The pulse forms a very good prognostic guide; with a full, hard, and impetuous pulse organic complications are to be suspected, and the case consequently assumes a grave aspect.

*Diagnosis.*—Puerperal mania is easily distinguished from phrenitis by the state of the pulse, the absence of the dry heat of the skin, suffusion of the eyes, and acute pain in the head, which are the distinguishing features of that disease.

*Treatment.*—As this is a disease of exhaustion, it must be combated by freely supporting the system with nourishing food easy of digestion, and a moderate amount of stimulants. Some patients obstinately refuse food, and consequently must be forced to take it, just as in the case of ordinary insane patients who reject nourishment. Strong essence of beef with a little port wine may be poured down the nostril with the aid of a funnel. Much may be done by moral treatment. It is highly requisite to have a kind yet firm nurse. A stranger to the patient can exercise much more control over her than one of the family; indeed it is usually better that the relatives should entirely absent themselves from the sick-room. Insomnia is a very troublesome symptom, and it is highly important to subdue it by one or other

the principal agents commonly resorted to for this purpose—a single full dose of hyoscyamine, morphia, chloral hydrate, or bromide of potassium. In the majority of cases a full dose (30 grains) of chloral hydrate combined with a small dose (a quarter of a grain) of morphia will be found most efficacious. If there is any tendency to cerebral congestion, bromide of potassium in 30-grain doses every six or eight hours, followed up by chloral hydrate alone, will act more beneficially. Chloroform has been most effectually used to procure sleep, but the patient is often more excited after the effects of the drug have passed off. Some use *cannabis indica* and *veratrum viride*, apparently with good results; the latter being a favourite remedy of Dr. Fordyce Barker of New York. Complications, such as intestinal derangement, pelvic and abdominal inflammations, must be sought for in suspicious cases, lest we lose sight of the greater disease in the prominent activity of the lesser. Disordered bowels should be relieved by a smart purge, which is often productive of considerable mitigation of the symptoms, but it must be given judiciously, for we must ever bear in mind that we are dealing with an essentially asthenic disease. When the acuteness of the attack has been subdued, great care will still be necessary to prevent a relapse and to restore the patient to health. The general strength must be sustained by plenty of animal food, with a due proportion of stimulants. Iron and quinine, especially the syrup of phosphate of iron and quinine, will be of great service.

The presence of husband and child must be cautiously tried, and if they still seem to irritate the patient, more time must be allowed for the restoration of her mind; indeed everything provocative of the least excitement or emotion should be avoided. Now it is that good nursing is of inestimable service.

A certain amount of control should be exercised without allowing the patient to be aware of it; her little eccentricities should be humoured, yet in such a manner as gradually to wean her from them, and to bring her mind back to its healthy tone, the danger now chiefly to be apprehended being not so much death as protracted or permanent insanity.

*Puerperal Melancholia*, like puerperal mania, is a disease of debility, and is often associated with over-lactation: it usually manifests itself about one month after parturition, and generally creeps on very insidiously, the patient becoming silent and moody, seeking solitude, and ceasing to take interest in her infant, or indeed in anything: she will often be found weeping silently, endeavouring to conceal her sorrow: attempts to cheer her act as incentives for floods of tears, and she renders all around her as miserable almost as herself. Morbid ideas gradually develop into delusions of the most distressing character, chiefly bearing on religious topics, and, as is common in this species of insanity, she perpetually broods over the supposition that, by some wilful act, she has placed herself beyond the pale of eternal salvation. The lacteal glands cease their secretion, the breasts becoming flaccid. The general health suffers more or less, but permanent insanity is the result chiefly to be apprehended. It must be borne well in mind that in puerperal melancholy the patient is prone to the commission of infanticide or suicide.

The treatment of puerperal melancholia beyond the administration of a strengthening and gently stimulating diet, pertains more to the alienist than to the obstetrician, the cure being accomplished by judicious guidance of the mind rather than by the administration of physic. The prognosis in puerperal melancholia is not so favourable as in the case of puerperal mania.

## CHAPTER XXX.

## PHLEGMASIA ALBA DOLENS.

THIS affection, generally but not uniformly associated with the puerperal state, is usually, as the synonym "white leg" indicates, confined to one of the lower extremities, most frequently the left, but occasionally the right leg suffers, and in rare cases even both legs are affected. Sometimes it leaves the limb originally affected and attacks the other. It has been met with also in the arm, and men are not altogether exempt from this affection. I have seen at least one instance during pregnancy, and it occasionally occurs during the non-gravid state after the removal of uterine polypi, etc. Multiparæ are more subject to it than primiparæ.

*Symptoms.*—This disease usually comes on from the fourth or fifth day to the twentieth or even later, and is ushered in with symptoms of variable intensity. As a rule, there is a sensation of chilliness, with rigors more or less marked, headache and faintness; the pulse is accelerated (120 or more), and in severe cases the tongue is dry and furred; round the pelvis pain is felt, which becomes localised in the inguinal region of the side about to become affected; the pain extends along the limb, which is now swollen, and for a time pits on pressure; the temperature of the affected part rises, and the swelling increases until the leg presents a tense, glazed appearance, devoid of colour; pressure

with the finger causes the surface to give way, but it regains its level immediately the pressure is removed; the veins, especially the femoral, can be felt as hard cords, painful to the touch, and the inflamed lymphatics appear as red lines distributed over the surface of the limb; the milk and lochia are generally suppressed. Sometimes the pain and swelling first appear about the knee or ankle, and spread upwards; but, as a rule, wherever the pain is first felt, there the swelling first appears.

The duration of the disease varies from one to two weeks, and in severe cases even longer. When about to subside, the pain and extreme tenseness decline, and the leg again pits on pressure; the constitutional disturbance passes away, and the pulse and tongue regain their normal state. The diffuse swelling is long in disappearing, the limb recovering but slowly its natural condition. Death is rare, but in unfavourable cases there is diffuse inflammation of the cellular tissue, abscesses, and suppuration of the femoral and inguinal glands. Occasionally permanent traces of the affection remain in the form of varicose veins and imperfect use of the limb.

*Pathology.*—The most prominent pathological sign is the plugging of the principal veins, especially the femoral, with coagula, a condition held by Dr. Robert Lee to be the result of phlebitis originating in the uterine and extending to the crural veins, hence the synonym "crural phlebitis." For a time this explanation was accepted, but the investigations of Drs. Mackenzie, Tilbury Fox, Mr. Henry Lee, and others, tend to disprove it. The result of a number of experiments made by the last-named gentleman went to show that it is exceedingly difficult to set up inflammatory action in the lining membrane of the veins, and that the thickening found on post-mortem



examination of the veins of patients who had died of phlegmasia dolens was the result of coagulation of the blood and not of inflammation. He also showed that certain substances, as pus, when mixed with the blood, have a powerful influence in hastening coagulation. Dr. Mackenzie thinks that inflammation of the crural veins would not produce phlegmasia dolens; that irritation of the lining membrane of the veins gives rise only to obstruction commensurate with the degree of irritation, and that the widespread obstruction of the veins in phlegmasia dolens cannot be caused by local irritation or inflammation; on the contrary, he thinks that the cause must be sought for in the vitiation of the blood by the introduction of morbid matter acting upon particular portions of the venous system.

Dr. Tilbury Fox holds that the characteristic appearance of phlegmasia dolens is produced by obliteration of the lymphatics, which are thus incapacitated from carrying the fibrin into the general circulation, so that it accumulates, especially in the cellular tissue, which is rich in lymphatics, and gives rise to the hard brawny feel so distinct from œdema. This condition of the lymphatics is coincident with occlusion of the veins.

It is not improbable that the complete and continued loss of power which characterises phlegmasia dolens is caused by pressure of the gelatinised fibrin on the nerve trunks. This rigid unyielding compression is far more injurious than the elastic pressure of œdema.

*Treatment.*—Since this disease is frequently associated with great loss of blood, as after placenta prævia, and seems always to be consequent upon a debilitated condition of the system, it is obvious that the older method of treatment, which included local

and general depletion, cathartics, etc., is not in accordance with the exigencies of the case. Unless the febrile symptoms run very high, a gently stimulating plan of treatment should from the first be adopted. The most successful plan of treatment is carefully regulated animal diet, with small but frequently repeated doses of dry old port, and carbonate of ammonia or hydrochloric acid. If the lochial discharge is stopped, frequent injections of warm water into the vagina are beneficial, adding, if the discharge is scanty and foul-smelling, a few drops of a solution of permanganate of potash, with which the uterine cavity itself may be washed out. As the alvine evacuations are very offensive, mild purgatives should be administered at frequent intervals.

The prominent symptoms—pain and sleeplessness—must be treated with opium and chloral hydrate. In insomnia without much pain, chloral hydrate will be sufficient; but if, as is often the case, the want of sleep is caused by excessive pain, morphia hypodermically administered will prove more efficacious.

Blisters have been highly extolled, and they are occasionally resorted to with advantage, being usually followed by a decided diminution of pain. Hot fomentations are very comforting, flannels wrung out of hot water and sprinkled with turpentine or laudanum often affording special relief.

After the swelling has reached the maximum and begins to subside, as shown by pitting upon finger-pressure, careful bandaging with flannel rollers is indicated.

During the convalescent stage, iron, quinine, and the mineral acids, may be advantageously substituted for the carbonate of ammonia. Moderate friction of the affected limb with stimulating liniments, tepid salt baths, and the passage of electricity in the con-

stant current form, are also useful. Friction should be cautiously used to avoid displacing any clots which may be present in the veins, for fear of producing embolism and sudden death.

If the glands suppurate or abscesses form, they must be treated in accordance with the general rules of surgery.

## CHAPTER XXXI.

## PUERPERAL FEVER.

Of all diseases incident to the post-parturient state, puerperal fever is the most to be dreaded, both by patient and physician ; for, in addition to its high rate of mortality, it converts those who come within the sphere of its action, each into a separate and independent focus of contagion, whence this fell disease may radiate in all directions.

Puerperal fever is confessedly an intricate and difficult study, beset with many hypotheses concerning its causation and development. Some regard it as a local disease, and limit its production solely to local causes ; others insist upon its essential nature, and hold that the local manifestations are the secondary results of a primary blood dyscrasia ; others again contend that puerperal fever is due to septicæmia or pyæmia, and draw a parallel between the recently emptied uterus and the wound from an amputated limb. The septic theory is held in Germany, and is ably supported by Schroeder. Hervieux entirely dissents from this school, and holds a modified view of the primary blood-affected theory, distributing the coincident local inflammations into separate and distinct diseases. Martin of Berlin attributes the causation of puerperal fever to a diphtheritic deposit on the surface of the parturient canal—a deposit consisting of sporules capable of finding their way into the

general circulation, and thus setting up fever. Wal-dayer of Breslau has found bacteria in the diphtheritic deposit on the inner surface of the uterus, and in the purulent exudations contained in the lymphatics, peritoneum, pleural cavities, and pericardium of patients suffering from puerperal fever, and he believes that the disease originates in the inner surface of the genital canal, and is thence transmitted along the lymphatics to the peritoneum.

The presence of micro-organisms and the part they play in puerperal fever has of late been much discussed, and the prevailing opinion is that these micro-organisms are not mere accompaniments of the disease, but are in fact the agents which convey the sepsis. When the fluid found in the peritoneum of a patient dying from puerperal fever is examined immediately after death, bacteria are found in great abundance; smaller quantities are also found in the fluids of the pleura, the pericardium, and the cerebral ventricles. During life these germs find their way into the lymphatics, along which they travel, and the direction they take determines the focus of the disease: when, for example, they find their way to the peritoneum they quickly perforate it, and, reaching its cavity, set up the malignant form of peritonitis denominated puerperal fever. Other local inflammations which accompany puerperal fever, as pleurisy, pericarditis, and suppurative inflammations of the joints, are produced in a similar manner. The germs find their way also into the vascular system, although during life they are not readily detected in the blood; after death they are found in prodigious numbers. When present in the blood they are sometimes deposited on the surface of the endocardium, giving rise to ulcerative endocarditis. The pathology of puerperal fever in its relation to micro-organisms has recently been

carefully studied by Doléris of Paris. This observer considers that puerperal infection is not due to any special condition of the patient, apart from the fact that in puerperal patients the state of their blood and nervous system is unfitted to resist the action of the morbid agents. Means of ingress to the germs are afforded by the rents in the mucous surfaces of the vagina and uterus, and by the contusions of the surrounding soft tissues which determine necrobiotic processes. It is not to be assumed, however, that in all cases the infection proceeds from local lesions, although they are its most frequent origin. The observations made by Doléris go to prove the presence and action of morbid organisms: he asserts that the germ of the disease is always present in cases of puerperal fever, and is always absent in the healthy woman; and that the germ is a living organism capable of being reproduced experimentally and of producing lesions similar to those observed in the ordinary course of the disease, and that the morbid germ varies according to the different forms of the disease. The lochial discharge may contain bacteria which have no specific action on the organism of the patient, such as the *B termo*, the ordinary accompaniment of decomposition. The micrococcus, "*en point double*," which takes the form of couplets or two minute spheres, which Pasteur considers to be the true agent of suppuration, is also almost always met with. The mortality increases in direct ratio to the number of micrococci present in a given quantity of the fluid; in other words, it is the quantity that endangers; a small quantity of very virulent micrococci is more easily combated than a large quantity of less potent germs. Doléris separates the morbid germs into two categories:—

1. Cylindrical bacteria (rapid septicæmia).

2. Micrococci in the form of chaplets (mild septicæmia).

„ Micrococci in the form of couplets (suppuration).

„ „ „ „ „ points.

Dolérís denies the possibility of anto-infection, and insists on the ingress of germs from without, which find their way into the cellular tissue, the lymph channels, and the blood. The phlebitis of puerperal fever is said to result from deposition of micrococci on the endothelial lining of the veins. When a blood-clot first forms in one of the venous trunks it becomes attached to the inner wall of the vessel; the micrococci by rapid multiplication undermine the clot and loosen its hold so that it is eventually detached and carried along in the blood stream, a nidus of micrococci accompanying it, and thus the formation of metastatic abscesses is explained. In cases of puerperal thrombosis, incipient suppuration is sometimes found in the centre of a clot, demonstrating that the cause exists in the blood itself. The infarcts which succeed embolism are either pyrogenic or septic, in accordance with the character of the primary clots; this again depends on the condition of the blood—on the presence, amount, and character of the germs. The formation of an infarct is thus explained by Koch:—The red blood discs are agglutinated and fixed in a capillary by the pyæmic micrococcus; the plug thus formed affords solid ground for the multiplication of the micrococci which then migrate into the neighbouring vessels. According to Heiburg they tend to propagate towards the surface of the organs attacked and to produce secondary cellulitis, peritonitis, pleurisy, and meningitis.

A discussion which took place amongst the fellows of the Obstetrical Society of London shows the conflicting

nature of the opinions held by the leading professors of the obstetric art. The name puerperal fever is to a certain extent misleading, inasmuch as it appears to be not a specific disease ; on the contrary, it includes a variety of abnormal conditions produced by a variety of malign influences. The advocates of the specific nature of puerperal fever hold that after eliminating cases resulting from contagious and infectious diseases, which occur independently of childbirth, there still remains an essential disease—puerperal fever. Dr. Fordyce Barker of New York, one of the ablest advocates of this view, considers that septicæmia and pyæmia differ from puerperal fever, and do not (to employ the essential part of the definition of puerperal fever in the *Nomenclature of Diseases*, drawn up by the Colleges of Physicians and Surgeons of London) constitute “a continued fever communicable by contagion.” Dr. Barker claims for puerperal fever a distinct entity, akin to that of typhus and of typhoid fevers, and he asks whether there is anything improbable in the hypothesis that septic poison, acting at childbirth on a peculiar state of the system, should produce a distinct disease. He maintains that when septicæmia or pyæmia complicates puerperal fever, the symptoms and clinical phenomena of that disease are commensurately modified. In marked contrast to the essential view of puerperal fever stands the septicæmic theory. It requires us to give up the idea of a fever, and teaches us to look upon puerperal fever, in all its various forms, simply as septicæmia. The septicæmists deny that the contagion of fevers, such as typhus and scarlet fevers, can produce puerperal fever ; they hold, on the contrary, that when a puerperal patient is infected with any form of essential fever, such fever retains its entity, and runs its course with little if any modification. The septicæmic view in this country is



rapidly gaining ground, and there can be little doubt, I think, that this hypothesis is adequate to explain the causation of many, perhaps of all cases of puerperal fever. Still, I believe, from personal observations, and from well-authenticated reports of cases, that exposure of a puerperal patient to the contagion of scarlet fever, etc., does in many cases set up a train of symptoms which constitute, to all intents and purposes, puerperal fever; the disease in such cases differing *in toto* from the disease giving the morbid impulse. As Drs. Barnes and Richardson so strongly insist, there can be no doubt we must look to the condition of the blood in a puerperal patient for the explanation of this apparent anomaly. The blood of a woman recently delivered contains, according to Dr. Richardson, an excess of from three to eight parts in a thousand of colloidal fibrin, with a coincident diminution in the salts; and both these conditions predispose to precipitation of the fibrin. Again, the amount of effete matter circulating in the blood derived from the foetus, and from the uterus itself, during the process of involution, tends to a condition of unstable equilibrium. In this condition any special morbid element may determine a rapidly fatal influence, and in a manner unconformable with the ordinary effect of the particular *materies morbi* in question.

On the other hand, many cases are on record where, in a puerperal patient, a specific disease, as scarlet fever, has run its ordinary course; other cases have been reported where puerperal patients have been subjected to the contagion of scarlet fever without any evil result whatever; but negative evidence of this sort is of little value. Dr. Braxton Hicks states, that of 89 cases of puerperal fever which he investigated, 68 had been connected in some way or other

with animal poisons, and of these more than one-half (37) had been infected with scarlet fever. It is recorded that a patient suffering from typhus fever was unwittingly admitted into a lying-in ward, which resulted in the death from puerperal fever of the two patients who occupied the contiguous beds.

The poison of erysipelas is generally supposed to be related to, if it be not identical with, that of puerperal fever, which is evidenced by the fact that in many cases parturient women have succumbed to puerperal fever after having been brought into contact with the poison of erysipelas. Moreover, the infants born of women attacked with puerperal fever are frequently affected with erysipelas, thus showing in a remarkable manner the alliance, at all events, of the two diseases, or the relationship of their factors.

Dr. Playfair very strikingly exemplifies the probable unity of these toxic agencies in his account of an outbreak of puerperal fever in the lying-in ward of King's College Hospital, which followed close upon an epidemic of erysipelas in the surgical wards.

The term *metria* has been used as an inclusive term for those conditions, whether of septicæmia, sapræmia, or puerperal fever, which attack lying-in women. Opinions lately have been tending to the belief that all cases of metria are due to septic poisoning, either introduced from without, *i.e.* from polluted hands of attendant, filthy sponges, ill-cleansed syringes, etc., or from the absorption of septic material from decomposing matter in the genital tract itself. The time, however, has not yet arrived when we can deny the possibility of outbreaks of puerperal fever occurring in hospitals or districts where the poor are much crowded together, although the nature of the infecting or contagious element has hitherto eluded any distinct grasp.

Many signal examples prove the contagiousness of puerperal fever, infected medical men and midwives having left a track of death in lying-in rooms, notwithstanding the observance of strict sanitary precaution. Mr. Robertson gives a notable instance, showing how one midwife attached to a lying-in hospital, among twenty labours, had sixteen fatal cases of puerperal fever, whilst the other midwives connected with the same institution attended, during the same period, 380 labours without the occurrence of a single instance of puerperal fever. The cases attended by the infected midwife were scattered amongst the patients of the other midwives, so that the infection was clearly traced to personal contact and not to local epidemic. Infection may be also carried from the dead body—dead from any disease, contagious or otherwise—to the lying-in woman; hence any one engaged in dissection should rigorously avoid the lying-in room.

The virulence of the morbid element may be further estimated by the failure of the extraordinary precautions taken by medical men who have been in attendance upon cases of puerperal fever. In one instance a doctor, who had become infected, had his hair shaved off, changed the whole of his garments, used baths, and washed his hands in disinfecting fluids, yet, notwithstanding all these precautions, the first labour he afterwards attended resulted in puerperal fever. Dr. Tyler Smith offers the most feasible explanation of this apparently paradoxical fact by suggesting that the blood of a person who has been in contact with a case of puerperal fever becomes infected, and is the medium which conveys the poison, although the conveyer himself may be in perfect health; and in support of this hypothesis he instances the fact that a woman, herself proof against smallpox, not unfrequently communicates the disease

to her unborn infant, the blood of course being the only channel through which infection could take place.

The various malarious exhalations from imperfect drainage, want of cleanliness, defective ventilation, with other nosocomial influences, are so many additional means of producing toxæmia.

From time to time severe epidemics of puerperal fever have produced an excessively high rate of mortality in childbirth. There is some difficulty in distinguishing between epidemic and contagious influences, but when several cases spring up in a town under the care of different practitioners, atmospheric influences perhaps, but more likely insanitary agents as bad drainage or polluted water are at work. When an epidemic sets in, the cases first attacked are most severe and intractable; after a time the miasm seems to become diluted or in some manner to lose its extreme virulence, the cases then diminish in severity, and become more amenable to treatment. The character of an epidemic varies from time to time, one batch of cases inclining to abdominal, another to chest or head complications, and consequently observers are apt to arrive at erroneous conclusions through making general deductions from the results of a single epidemic.

Owing to more stringent sanitary precautions, epidemics of puerperal fever are now not nearly so fatal as they formerly were; the fact that the contagiousness of the disease is all but universally acknowledged has largely contributed to the diminished mortality. It is in the lying-in wards of a hospital that an epidemic causes the greatest ravages, the fatality becoming sometimes so startling as to necessitate the closure of the ward, or even of the hospital itself. The results of private midwifery practice always compare

very favourably with those of the lying-in ward, especially when it forms part of a general hospital.

*Peritonitis.*—Of the various inflammatory diseases commonly associated with puerperal fever, the most frequent is puerperal peritonitis.

It usually first manifests itself on the second or third day after labour, but in rare instances its commencement coincides with, or even precedes, parturition, whilst, on the other hand, it may be delayed until the sixth or even the eighth day after labour. The symptoms are those of ordinary peritonitis aggravated in intensity and asthenic in type; the patient is seized with a rigor, generally of a marked character; her face is clouded with an expression of anxiety and dread of impending danger; the abdominal pain quickly increases in intensity; the temperature rises to  $102^{\circ}$  or  $104^{\circ}$ , and the pulse, thin and thready, is accelerated to 120 or 140, and the respirations to 25 or 50, or even more, in a minute; the tongue becomes furred, or is sometimes red, becoming afterwards dry and brown, and there is insatiable thirst; the bowels are copiously relaxed, the diarrhoea being often preceded by vomiting; the abdomen is distended with flatus; the uterine discharge is either arrested or becomes offensive; mammary secretion ceases; and the body is bathed in a copious perspiration. In fatal cases the disease pursues a rapid course, the pulse becoming more thin and wiry, the abdomen more tympanitic, low delirium sets in, and the patient dies.

The principal distinction between the simple peritonitis of childbirth and the peritonitis accompanying puerperal fever lies in the inflammatory character of the simple peritonitis as compared with the markedly asthenic nature of puerperal peritonitis. In simple peritonitis the bowels are usually confined; but, as just stated, in puerperal peritonitis there is diarrhoea.

Examination after death shows that the lymph effused in simple peritonitis tends to organisation, being of that adhesive character which mats together the adjacent organs; whereas the effusion of puerperal peritonitis is a dirty-looking fluid, with floating flakes of lymph, having no tendency to organisation.

I may here mention the disorder first noticed by Gooch, and afterwards very fully described by Ramsbotham, and named acute tympanitis, or false peritonitis, in which, without any inflammatory action, the symptoms very much resemble those of peritonitis. A careful examination of the case, however, with a consideration of its history, will enable us to form a correct diagnosis. The treatment consists in the administration of opiates.

*Puerperal Phlebitis* comes on usually a few days after labour. The first indication is a rigor, which is much less marked than in peritonitis; indeed the premonition not unfrequently takes the form of a series of slight shivers, rather than one well-marked shaking; the pulse and respirations increase in rapidity, though not so decidedly as in peritonitis, the pulse not often exceeding 120, and the respirations 25 or 30 in a minute; the temperature rises to 102° or 103°. The tongue is thickly coated, the bowels as a rule are relaxed; the uterine discharge is generally excessive and very offensive. The patient is bathed in copious perspirations, and she suffers from great mental depression. The pain is usually accompanied with more or less abdominal distension, is confined to the uterus, and is not nearly so great as in peritonitis. Béhier states that if the uterus is steadied with one hand, and grasped between the fingers and thumb of the other (the bladder being empty), "a painful cord-like induration" will be felt on one side—a symptom he holds to be of great diagnostic value since it is invariably

present before the other symptoms declare themselves. A vaginal examination reveals nothing special. In severe cases pyæmic deposits of pus take place in various parts of the body; the joints, the eye, especially the left, the lungs, liver, and kidneys, are the favourite seats of these secondary abscesses. When they appear on the surface, the first manifestation is an erysipelatous redness of the skin, accompanied with pain, which is followed by suppuration. In addition to these purulent depôts, we get occasionally sloughing of the tissues which cover certain prominent portions of the osseous system, as the sacrum, os calcis, etc., parts subject to pressure from the dorsal position of the patient. In some cases the threatened attack of local mischief terminates by resolution, the patient escaping both suppuration and sloughing. Post-mortem examination reveals the presence of a purulent fluid in the uterine veins and sinuses, and frequently in the Fallopian tubes, and the contiguous veins often contain thrombi.

Dr. Murphy denies that the presence of pus in the uterine veins indicates phlebitis, and states that if the fluid is carefully removed, the coats of the veins present a normal appearance. Dr. R. Lee maintains that the puriform fluid found in the veins is a consequence of inflammation of their coats. It is, however, more probable that the pus is generated in the uterus, and thence finds its way into the veins. The inner venous coat, being very delicate and non-vascular, seems incapable of generating pus. After intra-uterine injection of perchloride of iron for hæmorrhage, the uterine sinuses have been found to contain discoloured blood, showing that fluids within the uterus can find their way into the uterine venous system. In violent and prolonged phlebitis, the uterine tissues generally, and even the peritoneal covering, may be-

come involved, and give rise to more or less fibrinous and serous exudation on the peritoneal surface.

*Puerperal Metritis.*—The initiatory rigor ushering in puerperal peritonitis and phlebitis is rarely met with in uncomplicated metritis. The disease commences within the first few days after delivery with a dull uterine pain, which may be mistaken for after-pains, but it remains after these have usually ceased, and is more persistent; the pain differs much from that of peritonitis, for pressure is fairly tolerated and has to be occasionally resorted to in order to test the morbid sensibility of the uterus. The pulse ranges from 100 to 110, the temperature from 100° to 104° Fahr.; respiration is not much interfered with. The inflammatory process checks the progress of involution, so that the uterus can be distinguished above the pubes, after it ought to have subsided into the cavity of the pelvis, which in ordinary cases takes place before the tenth day. Besides the stoppage of the process of involution, the uterine structures become swollen by the inflammatory action, the result of these two conditions being often sufficient to keep the uterus so far above the brim that the os cannot be reached by the exploring finger in the vagina; when the os *can* be felt, it is hot, tumid, and sensitive to the touch. The lochial discharge is sometimes checked, at others it takes on a purulent and exceedingly offensive form, and if the disease goes on to death of the uterine structures, the discharge is characteristically fetid. Hervieux calls attention to the condition of the lochia as a diagnostic sign, stating that if it continues sanguinolent for several days longer than the normal period (three or four days), metritis is to be feared. In some cases abscesses form in the walls of the uterus, and if they open into the peritoneum the result is generally fatal. Metritis has been divided



into inflammation of the mucous membrane—endometritis, and of the muscular walls—parenchymatous metritis; the distinction, however, is of little practical moment. Endometritis may be present without implicating the rest of the uterine structures, but parenchymatous metritis is invariably associated with inflammation of the lining membrane, which has led some to suppose that general metritis always originates in that structure. In some instances the inflammatory process attacks the appendages of the uterus, the ligaments, Fallopian tubes or ovaries, causing more or less localised pain. Post-mortem appearances are mostly confined to the uterus, the peritoneum being usually free from effusion. The uterus itself is larger than normal, and when cut into is found, in severe cases, to be infiltrated with pus, or in a semi-sloughing condition; in the worst cases gangrene is more or less manifest. When death occurs in the early stage, the mucous membrane is found soft and thickened, and covered with a layer of tenacious mucus mixed with blood and epithelial debris.

*Angeioleucitis*, or inflammation of the uterine lymphatics, is scarcely to be distinguished from uterine phlebitis, the symptoms being much the same. Post-mortem examination shows the presence of pus in the lymphatics.

*Puerperal Septicæmia and Pyæmia*.—These two conditions, until late years, were considered to be solely dependent upon puerperal phlebitis. It is now generally admitted that the converse is frequently the case, and that a toxic condition of the blood is a cause of some of the prominent symptoms of phlebitis. The toxic influence may be derived either from without, *hetero-infection*, or from decomposition of materials within the organism, *auto-infection*. External influences may be conveyed by means of septic particles suspended in the atmosphere, or by the hand of the

physician, by the agency of a catheter, sponge, or other object, which, having been infected with a septic ferment, is placed in contact with a recent wound of the parturient canal. Dr. Wiltshire relates a case in which the septic influence was traced to the befouling of the atmosphere through emptying a dust-bin. The case first exhibited the ordinary symptoms of septicæmia; later on phlegmasia dolens of the left leg supervened. The patient from time to time suffered unaccountable relapses, which were afterwards found to be synchronous with the periodic emptyings of the dust-bin, and there seemed little doubt that the illness was originally started by poison derived from the same source. Auto-infection results from absorption of the toxic elements produced by necrobiosis of a portion of the genital system, or from decomposition of retained blood-clots. To insure this absorption there must be a recent solution of continuity of the surface of the parturient canal, since, according to Billroth, healthy granulating sores do not absorb. Now, Schroeder has shown that slight rents of the vaginal mucous membrane are of frequent occurrence after labour, so that, given the presence of a septic ferment, we have the requisite conditions for its absorption. Dr. More Madden directs attention to laceration of the cervix uteri through improper use of the forceps as an important factor in the modern etiology of puerperal septicæmia. Infection may follow the retention of a dead foetus in the uterus, though, according to Schroeder, this takes place only when, through rupture of the membranes, the foetus is exposed to the influence of the air. Dr. Barker maintains, and cites cases to prove, that the same results may follow without rupture of the membranes. I have often seen septicæmia follow placenta prævia and cases of severe hæmorrhage.

In cases of septic poisoning, the blood after death is fluid and dark, and the mucous membrane of the intestinal canal softened and tumefied. The researches of Dr. Burdon Sanderson and other microscopists prove the occasional presence of bacteria in septicæmic blood, but the actual part these bodies play is not yet understood.

The term *sapræmia*, or septic intoxication, is given to an acute form of blood-poisoning due to the absorption of the chemical products of decomposition derived from putrid materials lying in the genital tracts after parturition. These products probably contain organisms, which, however, do not multiply in the blood after their absorption, and, according to Matthews Duncan, "do not survive, far less grow therein." Koch, however, states that, in cases of acute septic intoxication, no organisms are found in the blood during life nor immediately after death. This condition, then, is not, as in septicæmia, perpetuated by the absorption and multiplication of bacteria in the blood, but by repeated supplies of the poison gathered from the genital tract and absorbed by the open uterine veins and sinuses.

The most common cause of *sapræmia* is a want of proper contraction of the uterus after delivery, which often follows a tedious, a too rapid, or an instrumental labour. This atonic state of the womb, coupled with the ragged wound left after the removal of the placenta, favours the lodgment and decomposition of clots, membranes, or bits of placenta, and forms a favourable nidus for the development and absorption of putrid fluids.

The treatment of *sapræmia* is obvious, and is in many cases successful. The uterus should be explored by the fingers, the hand, or the ovum forceps, and clots, fragments of placenta or of membrane, removed ;

in a word, everything should be done to favour the formation of healthy granulations in the placental wound. After the removal of the decomposing material the uterus should be irrigated with a solution of carbolic acid (1 to 50) or a weak solution of permanganate of potass twice a day, and repeated as long as the temperature remains high. As the retention of secretion is largely due to imperfect contraction of the uterus, ergot should be given in half-drachm doses two or three times a day. Quinine in five-grain doses must be given every four hours to subdue the fever and reduce the temperature, and should be continued until all fever has subsided. Pain, restlessness, and insomnia are to be treated by morphia, bromide of potassium, and chloral.

*Pyæmia* is literally the absorption or introduction of pus into the general circulation, supposed to take place, under certain conditions, through the coats of the blood-vessels, and thus it is that pus-corpuscles migrate from one locality to another, producing the secondary deposits so characteristic of the disease. We are, however, destitute of evidence to prove that the pus-corpuscle itself acts as a poisonous ferment; indeed, experimental researches point in an opposite direction. Virchow states that capillary embolism, by producing blood stasis, is the cause of multiform pus depôts, each hæmorrhagic infarction giving rise to suppuration. Septicæmia and pyæmia are practically the acute and subacute forms of the same disease. The ordinary symptoms of blood-poisoning are common to both forms—rigors, a rapid rise in temperature, sometimes as high as 106° Fahr., with the general symptoms of pyrexia, prostration of the mental and physical powers, and copious diarrhœa, being the most characteristic; the symptoms varying with the degree of toxæmia. In pyæmia the formation of

secondary pus deposits in the neighbourhood of the joints, in the lungs, pleura, pericardium, liver, and other localities, is of common occurrence.

We have now to direct our attention to the general aspect of puerperal fever. The disease usually commences on the second or third day after delivery, though, as was previously stated, it may be developed during labour, or be retarded until the seventh or eighth day after, but not later. The invasion may be marked with a rigor, though it is often slight enough to escape notice; the patient's mind is from the first much depressed, and she is harassed with gloomy forebodings, a condition painfully shown in the pinched and haggard face and sunken eyes. The tongue is moist, with a white or brown fur, and shows the indentation of the teeth; the pulse is very rapid, from 110 to 160, and the respirations are increased to 50 or 60 in a minute; the temperature varies from 102° to 106° Fahr. The skin, as a rule, is hot and dry, although in some instances there is excessive perspiration; vomiting of a green or brown coloured fluid is sometimes met with, especially at the later stage of the disease; diarrhoea is generally present, and in cases of septicæmic origin, the alvine discharge is more than usually fetid. The condition of the lochia is greatly dependent upon the state of the uterus; in metritis or phlebitis the discharge may become foul or cease entirely, but when no complication exists it not unfrequently remains unaffected.

At the outset there is usually a certain amount of vague abdominal pain in the hypogastric region, which, if followed by peritonitis, rapidly increases to positive agony, and radiates over the whole abdomen; the pain is aggravated by abdominal tension, first from flatus simply, and afterwards from the effusion

of serum. As a rule the brain is not implicated to any extent, though there may be low delirium. If the case is of adynamic form, the foregoing symptoms rapidly lead to dissolution, and shortly before death the pain frequently lessens in violence, and the patient lies prostrate without complaint. As was previously remarked, the special character of puerperal fever changes from time to time, the local complications now attacking the abdomen, now the chest; but in the most severe form the patient is cut down without the supervention of any local symptom whatever. The adynamic form of puerperal fever is usually the result of zymotic influences, and is now chiefly confined to the lying-in wards of hospitals, being comparatively rare in private practice. In cases of this type, death takes place within the first week, sometimes on the second or third day; and indeed cases are recorded where the patient succumbed within twenty-four hours.

Post-mortem examination reveals nothing of pathological import except the condition of the blood, which is very dark and possesses a peculiarly offensive odour; the coagulum is friable and of the consistence of jelly, the lowest stratum containing an excess of the dark colouring matter, which falls to the bottom of the vessel during coagulation; the usual conditions of hydræmia are evidenced by the diminution of the quantity of red discs, and the increase of the white corpuscles, fibrin, and extractive matter.

*Treatment.*—Prophylactic. As blood-deterioration is one of the great predisposing causes of puerperal fever, hydræmia must be combated by a generous diet and the administration of salts of iron, either alone or in combination with quinine. Excess of fibrin may be reduced by the free use of vegetables, by salines, and the vegetable acids, with a due amount of

exercise. Mental depression is another predisposing influence which is generally difficult to alleviate; change of scene and cheerful company will, however, conduce to this end. The uterine discharge, if offensive, should be corrected by the injection into the vagina of a weak solution of permanganate of potash or carbolic acid, and the parts should be kept clean. Moreover, the most scrupulous care must be taken by the accoucheur to avoid the risk of carrying any toxic influence to the lying-in woman. He should avoid dissecting and post-mortem rooms, especially when a corpse has been the subject of puerperal fever, peritonitis, scarlet fever, or erysipelas.<sup>1</sup> Contact with any source of cadaveric poison demands the free use of disinfecting preparations. No one who has attended a case of puerperal fever is justified in performing the function of an accoucheur until the lapse of some time, say a fortnight, and not even then without taking special sanitary precautions. Dr. Priestley recommends a week's seclusion after regular attendance has ceased on a single case of puerperal fever; and when a series of cases has occurred in the practice of any one, he should absent himself from midwifery practice for one month at least. During either the shorter or longer interval of seclusion, the means for disinfection should be fully carried out. It should be borne vividly in mind that the delivery of a woman by an attendant who has been exposed to the influences just mentioned, involves the imminent risk of carrying death to the bedside of his patient. Whenever the practitioner has been brought in contact with a source of septic poison, whether

<sup>1</sup> Dr. Wendell Holmes lays great emphasis on this point in his *Currents and Counter-Currents in Medical Science*, Boston, 1861; a scholarly work that every student of medicine would do well to read.

from attendance on a case of puerperal fever, or from handling the dead subject, he should resort to frequent ablutions, not only of the hands but of the whole body, taking special care to remove all traces of foreign matter from under the nails, and to add carbolic acid, Condly's fluid, or tincture of iodine to the water. Turkish baths, or fumigation of the person with the vapour of iodine, may also be resorted to with advantage.

The general treatment varies in each individual case with the character of the disease; the increase in temperature should be combated by quinine in large doses, 10 or 12 grains dissolved in a solution of hydrobromic acid being given every six or eight hours until the desired result is obtained. Dr. Wiltshire remarks that the reduction of the temperature by quinine is more pronounced in cases of septicæmia accompanied by diffuse suppuration, than in cases of blood-poisoning unattended by suppuration. The body should be sponged with cold or tepid water, rendered more refreshing by the addition of a little toilet vinegar; restlessness and insomnia are to be treated by morphia, either in the form of pill or draught, or by hypodermic injection; occasionally it is advantageously administered as a suppository; chloral hydrate, either alone or combined with morphia, is a valuable hypnotic. Dr. F. Barker highly extols the action of *veratrum viride* in five-minim doses of the tincture every hour until its influence is established as a controller of the heart's action. *Digitalis* and *aconite* have also been recommended for the like purpose, and in the hands of some the internal administration of turpentine has proved of much value. Enemata containing castor-oil or turpentine are to be preferred to purgatives; diarrhoea demands the use of opium; sickness should be allayed by ice, soda, or other effer-



vescing waters, champagne, and morphia. General depletion is not admissible in any stage of the disease, but, as will be presently mentioned, leeches are sometimes serviceable. The so-called eliminative plan of treatment with ipecacuanha and calomel is rarely of much utility, and tends further to depress the patient.

In cases of pyæmic or septicæmic origin, the attempts to destroy the morbid element in the blood by means of chlorine or carbolic acid have hitherto proved futile. Chlorate of potash and perchloride of iron are of much use in restoring the healthy character of the blood. In the three epidemics of puerperal fever, more or less severe, which I have witnessed, I, in common with other observers, have been struck with the uncertainty of the action of remedies. In one epidemic turpentine seemed to be much more efficacious than in the other two; but in those adynamic cases where retching, gulping, nausea, vomiting, and diarrhoea come on at any early stage, it is impossible to give this remedy; in such cases I have found a combination of chloral hydrate, morphia, and aconite very useful.

The systematic washing out of the uterus with a weak solution of permanganate of potash in warm water is of great service; indeed I have often seen a marked improvement take place in a few hours, the temperature and pulse being reduced, and the patient expressing herself greatly relieved. In using intra-uterine irrigation, care must be taken not to distend the uterus, otherwise the injection inflicts severe pain, and is liable to pass through the patulous Fallopian tubes into the abdominal cavity. This accident may be avoided by injecting the fluid slowly, and by allowing plenty of space around the injecting tube for the fluid to escape.

The diet, of course, must be regulated by the exi-

gencies of the case ; nutritious, but not stimulating, in the more sthenic form ; freely stimulating from the first in the adynamic form. In case of thirst, a little dilute phosphoric acid sweetened with syrup forms a refreshing drink. Abdominal pain should be mitigated by turpentine stupes, or by the application of flannel or cotton-wool sprinkled with laudanum. Poultices, though sometimes very comforting, are, as a rule, too heavy to be borne. In extreme pain from violent peritonitis, the application of leeches to the abdomen will generally afford relief ; some recommend blisters, but I prefer fomentations, and, if necessary, leeches. Flatulent distension of the intestines, so apt to intensify the pain and distress, may be reduced by the use of a long rectum tube, or, if needful, by the introduction into the colon of a very fine hollow needle. The abdominal pain must be treated likewise with morphia, administered either hypodermically or by the rectum, and it must be given freely, for the tolerance of this drug, under the circumstances, is very marked, so that unless given freely it is useless. Dr. Rigby's encouraging advice on the necessity of persevering treatment, notwithstanding all adverse symptoms, forms a fitting conclusion to this chapter. " Even when the face is assuming a Hippocratic appearance, the pulse so rapid and feeble as scarcely to be counted, where the abdomen is immensely distended, with cessation of pain and cold clammy state of the skin, we ought not to despair. No case, however bad, is entirely hopeless ; and although the majority of such cases perish in spite of the greatest care and activity, still we are justified in persevering till the last, knowing from experience that we every now and then succeed, even at this late hour, in rescuing our patient."

## CHAPTER XXXII.

## THROMBOSIS AND EMBOLISM.

THESE two affections, which, for reasons presently to be assigned, are specially liable to attack puerperal women, are, with certain differences, essentially analogous. By thrombosis is meant the occlusion of a vessel, arterial, venous, or lymphatic, through the local formation of a fibrinous clot or coagulum. Embolism consists in the plugging of a vessel through the detachment of a clot formed at a distance from the point of arrest, the clot being first deposited in one of the larger vessels, or in the heart itself. After a time, a part or the whole being detached, it is carried forward with the blood current, until, arrived at a branch too small to allow it to pass, it is forced into the vessel as far as it will go, and embolism is the result. When the pulmonary artery is the seat of mischief, as is most frequently the case, intense dyspnoea, with pallor of the face, coldness of the extremities, and the usual symptoms of severe collapse, set in, quickly to terminate in death, although in some cases the patient responds to the action of stimulants and rallies, either again to sink in a few hours, or, in rare instances, finally to recover.

If thrombosis takes place in one of the peripheral vessels, the danger to life is not so imminently threatening, the peril being in direct proportion to the size of the artery obliterated. The symptoms are,

severe pain, often agonising, about the seat of mischief, generally in one of the extremities, without at first any corresponding swelling or inflammation; pulsation ceases below the seat of obstruction, and the temperature is reduced. If the occluded artery is large there is generally immediate paralysis of the motor or sensory or of both nerves of the affected limb, which is sometimes followed by gangrene. If one of the cerebral arteries is plugged, hemiplegia more or less pronounced is the result. Cerebral and peripheral thrombosis is of rare occurrence in the puerperal state.

The causes which lead to the formation of fibrinous clots are the hyperinotic condition of the blood in the gravid state, coupled with its undue tendency to coagulation. This tendency to coagulation is increased after excessive hæmorrhage, and from other causes which reduce the activity of the circulation, and induce a proneness to syncope. The introduction of certain septic matters into the blood, as was explained in the section on Phlegmasia Dolens, exerts a direct influence in causing coagulation. In the non-gravid state, in rheumatism, typhus fever, and phthisis, thrombosis not unfrequently proves suddenly fatal. It was formerly assumed that embolism was invariably the cause of occlusion of the pulmonary artery; local coagulation, however, may take place in the pulmonary artery independently of the previous formation of clots in distant vessels, and in many cases coagulation producing thrombosis begins and ends in the pulmonary artery itself.

The acute symptoms usually come on after some slight exertion, causing, in the case of embolism, detachment of a fragment of a clot already softened and but loosely adherent to its site, and in thrombosis, the propulsion of the clot forward so as to totally

occlude the vessel through which it previously allowed the passage of sufficient blood to carry on the circulation.

The sudden deaths resulting from these causes were formerly attributed to a condition termed idiopathic syncope, but the characteristic apnoea indicates the actual cause of death.

Dr. Playfair points out that as it takes time for a clot to undergo the amount of retrograde metamorphosis necessary to loosen it from its attachment, embolism is not likely to occur before the third week after delivery, but that thrombosis may occur much earlier, owing to the tardy degenerative stage not being an element in its causation.

*Treatment.*—In the rare instances where death does not anticipate the arrival of the physician, stimulants freely administered are his mainstay, alcohol and carbonate of ammonia being the most efficacious forms. The pain of peripheral thrombosis must be relieved by opium, and the subcutaneous injection of morphia affords the most speedy mitigation of suffering.

## CHAPTER XXXIII.

### PELVIC CELLULITIS AND PELVIC PERITONITIS.

INFLAMMATORY processes, frequently of low and insidious type, may attack the peritoneum and cellular tissue of the internal generative organs. Such lesions are common to both puerperal and non-gravid females. Our attention, however, will be directed solely to those forms incident to parturition. Of late years much attention has been bestowed upon the subject, and investigators have somewhat perplexed it with a superfluity of descriptive terms. When the cellular tissue surrounding the uterus and its appendages is the seat of inflammation, the disease is usually called pelvic cellulitis; and when the peritoneal covering of these organs is attacked, pelvic peritonitis. A variety of synonyms has been proposed for these not altogether satisfactory terms; but as the suggested substitutes are themselves by no means free from objection, I prefer to retain those in general use. Dr. Matthews Duncan, following Virchow, proposes the prefixes *peri* and *para*, as perimetritis, para-metritis—signifying respectively inflammation of the serous envelope of the organ and of its cellular tissue. These prefixes may be used to differentiate the character of the inflammation attacking any of the pelvic organs, but inasmuch as we are unable to ascertain clinically, with any degree of certainty, the particular organ affected, the distinc-

tion appears to me too subtle for our present means of diagnosis.

Dr. Leishman very shrewdly expresses a wish for a single inclusive word to comprise the whole of the internal organs of generation to which the above-mentioned prefixes might be conveniently applied, as we should then avoid committing ourselves to an arbitrary and often impossible distinction. Barnes overcomes the difficulty by using the term "*perimetric inflammation*" to include both cellular and serous inflammations, inasmuch as they are in the great majority of instances coincident, although in individual cases one form may preponderate over the other.

In the early stage it is impossible to discriminate whether the cellular or the peritoneal tissues are primarily attacked, although, when the disease has somewhat advanced, particular symptoms may predominate, according to the special character of the lesion. We are therefore, in a measure, constrained to consider these diseases collectively.

First, then, as to causation:—One prevailing factor is a septicæmic condition of the blood; indeed, certain types of pelvic cellulitis and peritonitis seem but modified forms of that hydra-headed scourge puerperal fever. When the septic element is present in only a limited degree, especially if the systemic powers are vigorous, and the blood not yet much depraved, it is not difficult to conceive that the morbid action may be confined to a circumscribed area in the immediate vicinity of the source of pollution. Again, excessive hæmorrhage, the deteriorated condition of the blood during the puerperal period, and the greater or lesser amount of bruising and stretching which the tissues have undergone during labour, engender an unstable condition, which requires only a comparatively slight

morbid impulse to excite inflammation—the too early resumption of the erect position, for example, excessive exertion, or the effects of cold, either local or general. Dr. M. Duncan strongly insists that the disease may likewise originate in metritis.

According to Piotay and Grisolle pelvic inflammations, owing to the greater severity of the labour, are more liable to occur in primiparæ than in multiparæ; that mothers who do not suckle are more liable to attacks than those who do; and that imperfect contraction of the womb is a predisposing cause.

Pelvic cellulitis most frequently originates within the folds of the broad ligaments, and in the cellular tissue surrounding the uterus, whence it spreads more or less along the contiguous fasciæ through the whole of the pelvic cavity.

In the first stage, immediately following the initial hyperæmic condition, the tissues become infiltrated with serum, producing a more or less elastic swelling. When the connective tissue and pelvic fasciæ are rendered tense by this effusion the swelling is firm and unyielding. The rapid disappearance of the hardness, and the absence of any remaining induration proves that it was not due to effusion and organisation of lymph. In the majority of cases the serous infiltration is followed by exudation of coagulable lymph sometimes in quantity sufficient to form only a thin layer over some of the pelvic viscera; at others enough to fill the entire pelvis, and to mat together all the neighbouring organs. The position and shape of the swelling varies: at first it may be globular; soon, however, it takes an irregular form, and extends between the layers of pelvic fasciæ towards the pelvis, the direction being from the centre to the circumference. The



anatomy of the pelvic fasciæ has been carefully studied with the view to determine their influence on the course of cellular inflammation. König made some striking experiments to show the various routes by which fluids may traverse the pelvic fasciæ. He injected water and air into the uterine cellular tissue, and found that the fluid followed the path of the psoas and iliacus muscles into the pelvis, or along the round ligament towards the iliac fossa, or towards Douglas' fossa, according as the injection was passed into the fasciæ of the Fallopian tubes, uterine cervix, or posterior part of the broad ligaments. Dr. Priestley very truly remarks that, however valuable such investigations may be as a guide to the direction taken by serous effusions or purulent fluids, which ordinarily follow the path of least resistance, it is of little use as an index to the course of active inflammatory exudation, which readily passes by contiguity—the layers of fasciæ opposing no efficient barrier. The most frequent site of a localised phlegmon is between the cervix uteri and the rectum, tending to spread along one or other broad ligament to the other side of the womb. Sometimes the swelling is situated between the bladder and the uterus, and more rarely in front of the bladder. The most remarkable characteristic of the swelling at this stage is its extreme hardness; it seems as unyielding as a uterine fibroid, and to the finger gives a sensation of resistance like the very bones of the pelvis. The swelling is irregular in shape, in accordance with the direction taken by the exudation. The uterus rigidly fixed seems as though welded to the pelvic walls. This condition may terminate in resolution, the effused fluid being gradually absorbed, whilst the tumour, without losing its hardness, slowly diminishes in

bulk until it finally disappears, leaving the uterus either temporarily or permanently adherent to the neighbouring organs. In less favourable cases purulent degeneration takes place, the matter seeking exit through either the abdominal walls, the rectum, vagina, or bladder, or even into the cavity of the peritoneum. The formation of pus rarely takes place before the tenth or twelfth day after the hyperæmic stage, and it may occur much later. Since the surrounding tissues are all infiltrated and thickened, it is often no easy matter to detect the pus by physical examination, more especially as suppuration is frequently set up in isolated loculi which may discharge their contents independently, or may in the end unite and form a large collection of pus.

Bernutz considers that the pelvic peritoneum, not the cellular tissue, is the seat of inflammation, and observes that the cellular tissue surrounding the uterus and its appendages is so scanty (with the exception of a small ring round the juncture of the body and cervix, and between the folds of the broad ligaments) that it is impossible for a phlegmon to be formed in it. He further holds, that the collections of pus which succeed the phlegmons are intra-peritoneal, and are contained in cavities formed by the matting together of the pelvic viscera, and not in the connective tissue between the organs and their serous envelopes. This view is not as yet received in this country, although to a certain extent the statements of Bernutz have been corroborated by Dr. M. Duncan and others, who have reported cases where collections of fluid, generally serous, have been retained in cysts formed by the separation of a portion of the peritoneal cavity by adhesive inflammation.

*Pelvic peritonitis* commences by hyperæmia of the peritoneal covering of the pelvic organs, speedily fol-

lowed by exudation of lymph and subsequent matting of the neighbouring organs. The adhesions thus formed, if few, may not materially restrain the mobility of the organs affected; usually, however, they are sufficiently numerous as to bind the uterus and its appendages into fixed positions, and not unfrequently to completely mat the entire pelvic viscera so as to form the resemblance of a solid tumour. Portions of the peritoneal cavity, as previously stated, may be sealed off from the rest, and being filled with serum or pus, may form fluid tumours without any cyst-walls other than those afforded by the surrounding viscera. The exuded lymph, instead of organising, may break down into pus, sometimes in several spots, so as to form distinct abscesses. When absorption of the exuded material takes place in pelvic cellulitis and pelvic peritonitis, there is this marked difference in the result:—In cellulitis the products of inflammation may be completely removed, whereas in peritonitis, after the absorption of the more fluid part, adhesions may remain.

*Symptoms.*—The invasion is usually marked by a slight rigor followed by pelvic pain, which spreads to the hypogastric region, the pulse quickens to about 100 in a minute, and the temperature rises to 100° or 102° Fahr.; the tongue is furred; there is a tendency to nausea, the bowels are constipated, and after a time micturition and defæcation become painful and difficult. To relieve the tension as far as possible, the patient will generally be found lying on her back, with the thigh of the side affected flexed on the trunk, this position being very significant of pelvic inflammation. In some cases there are no premonitory symptoms, but merely a gradual falling away from health for several weeks after labour, until at last the pelvic indications manifest themselves. In

these cases, however, there is generally a considerable acceleration of the pulse from the first, which ought to put the attendant on his guard, and lead him, from time to time, to investigate the state of the pelvic organs.

Physical examination reveals at first tenderness over the lower part of the abdomen, with a hot, dry, and painful condition of the vagina. After a time a diffuse swelling may frequently be detected by careful pressure on the hypogastric region low down in the pelvis. The tumour gradually becomes well defined and very hard, and may be detected also through the vaginal walls, for on carrying the finger to the top of the vagina, the cervix uteri is found tumid and patulous, with a hard nodulated swelling round it, so as often completely to obliterate the vaginal *cul-de-sac*. Rectal examination further corroborates the estimate of the size and position of the tumour. When the exudation is slight the finger in the vagina can often detect the presence of a thin layer of plastic material which forms a roof to the pelvis, fixing the pelvic contents and separating them from the other abdominal viscera. This is the result of pelvic peritonitis without cellulitis. When the swelling is localised its excessive hardness may lead to the suspicion of malignant disease; the previous history of the case, however, will determine the diagnosis.

If the disease goes on to suppuration, there is an increase in the febrile symptoms of a hectic character, with night sweats and diarrhoea, the swelling softens, and the pus seeks exit by one of the various channels previously indicated.

Pelvic peritonitis does not usually come on till two or three weeks after labour, and its duration varies from a few days to several months. The uterine fixation often lasts for years, and in many cases remains permanent.

Dr. Braxton Hicks gives the following epitome of differential symptoms in pelvic cellulitis and peritonitis :—

#### PELVIC CELLULITIS.

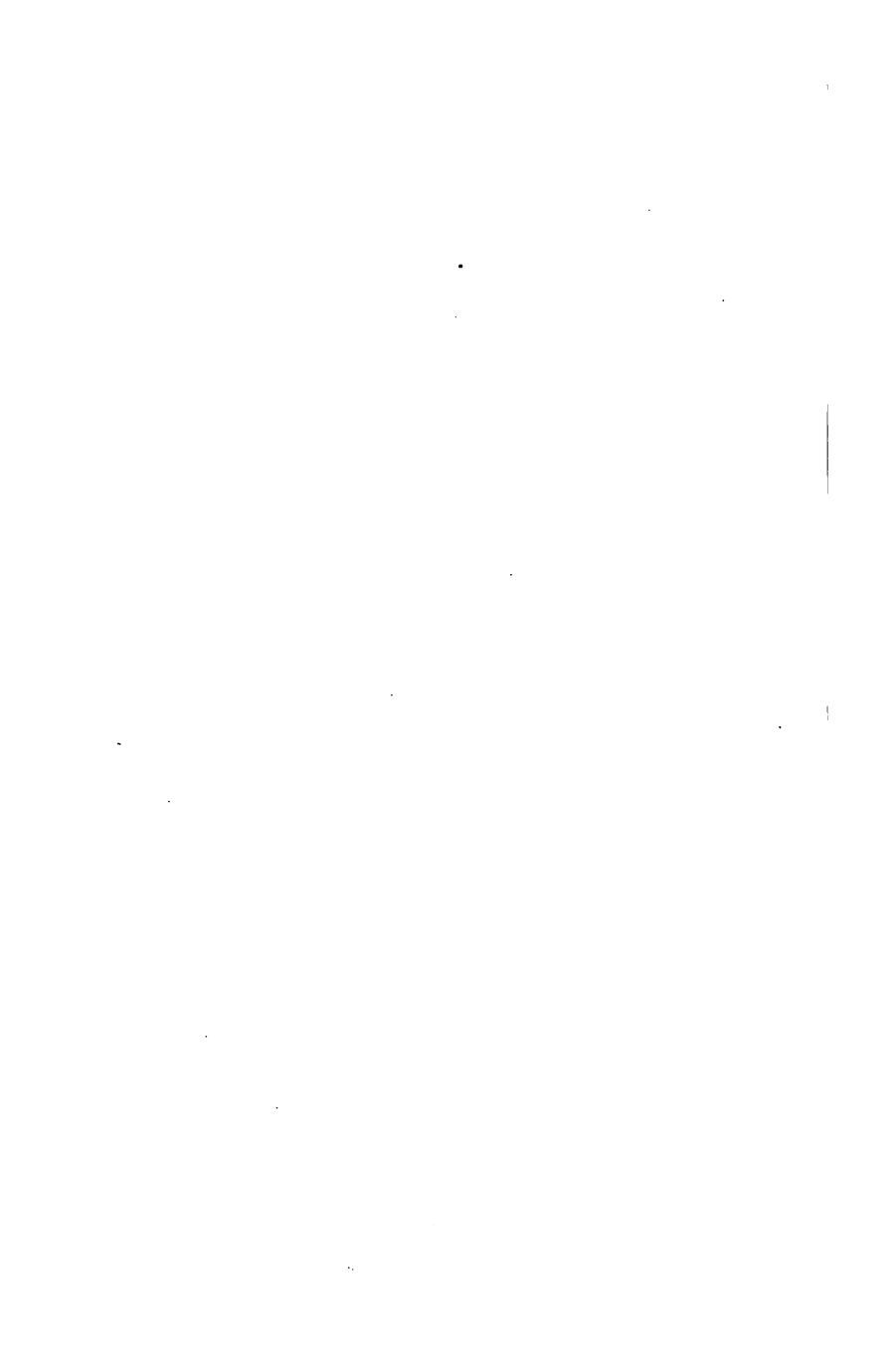
1. Tumour easily reached ; generally easily and early felt in neighbourhood of broad ligaments and above pelvic brim.
2. Abdominal pain, increased by deep pressure.
3. Temperature usually not above  $102^{\circ}$ ; pulse full, soft, dicrotic in septic form.
4. Retraction of thigh with abduction. Pain down leg.
5. Nausea, vomiting not excessive.
6. Not accompanied by tympanitis.
7. Marked tendency to suppuration.

#### PELVIC PERITONITIS.

1. Tumour not noticeable for some days.
2. Abdominal tenderness of an acute kind, quickly increased on pressure. Form of coils of intestines mapped out on abdomen. Fixation of abdominal muscles.
3. Temperature above  $102^{\circ}$  usually; pulse wiry in benign, dicrotic in septic form.
4. Pain down leg and retraction of thigh never present.
5. Nausea, vomiting excessive.
6. Tympanitis present in severe cases.
7. Constipation often marked.
8. Suppuration not often present.

*Treatment.*—If in the early stage there is much pain, with inflammation of a sthenic type, a few leeches may be applied to the abdomen. Poultices and hot fomentations prove soothing, and the vaginal

douche as hot as can be comfortably borne may be advantageously used. Opiate suppositories, or the hypodermic injection of morphia, will lull excessive pain. Some recommend a mercurial form of treatment, but I am doubtful as to its advantages, especially as it is apt to bring on diarrhoea. Diarrhoea must be controlled by opium, and sickness may be alleviated by hydrocyanic acid, bismuth, ice, or potass water. The patient must be kept perfectly quiet, and should be supported by a nourishing and slightly stimulating diet. Quinine, the mineral acids, and chlorate of potash will, each or all, be found useful during certain stages. If the temperature is very high quinine is indicated, but as the stomach often rejects this drug, it is a good plan to administer ten or fifteen grains in gruel into the bowel. When the tumefaction is slow to depart, and still no signs of suppuration are manifest, "flying" blisters and iodine inunction may be resorted to. A collection of matter must not be opened too early: indeed some authorities, amongst whom are West, Aran, and Becquerel, advocate leaving the time and course of exit entirely to nature; but in many instances much time and suffering may be saved by a judicious resort to the scalpel. The following localities, in the order of their enumeration, are the most favourable sites for the discharge of pelvic abscesses,—rectum, vagina, abdominal walls, and bladder.



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